

Name of subject	Methodology of scientific research (ECTS 4)
Subject/module code	ITM1104
Science taught semester (s).	1 st semester
Responsible teacher	Yuldashev Urishbay, professor
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-120 Audience Training hours – 36 Lecture training hour – 18 Practical training hour – 18 Independent education -84 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is It is the study and application of methods and approaches used to obtain scientific knowledge in a consistent, accurate, and well-founded manner. That is, through this methodology, the researcher determines how to approach the scientific problem he has set himself, what data to collect, how to analyze them, and how to base conclusions on them. The objective of the course It aims to study the current state of the energy system, introduce the specific features of the main enterprises and organizations that are part of the country's energy system, teach various methods of generating electricity. In addition, it provides theoretical knowledge and develops practical skills in the transmission, distribution and use of electricity. Learning Outcomes: 1. The Scientific Research Methodology course explores the role of science in production; 2. Science algorithm, object, task, model representation, experiment and its execution; 3. Stages of conducting research, analysis, synthesis, correction, presentation of results and recommendations for production; 4. Selecting objects, model classes, and functions; 5. Manifestations of task resources, sequence in task expression; 6. Scientific and technical information, level of information (color), generalization of knowledge, methods of information acquisition; 7. Standard indicators of measuring devices. Histogram; 8. Determining random error, probability distribution, methods for obtaining the exact value.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topics: 1. Fundamentals of scientific research. 2. Preparing for scientific research. 3. The content and implementation methods of the research stages. 4. The content and implementation methods of the research stages. 5. Analysis of the stages of scientific research. Selection of object, model and task. 6. Planning, conducting experiments, and analyzing the results obtained. 7. Planning, conducting experiments, and analyzing the results. 8. Fundamentals of experimental design. 9. Preparing and conducting an active experiment. II. Instructions and recommendations for organizing laboratory exercises. Laboratory work is not included in the curriculum

	III. Practical training instructions and recommendations The instructor's preparation for a practical session begins with the study of initial documents (such as the curriculum, topic schedule, etc.) and concludes with the development of a detailed lesson plan. The instructor must have a clear understanding of the objectives and tasks of the practical session, as well as the amount of work each student is expected to perform. Methodological guidelines serve as the primary instructional document for instructors in preparing and conducting practical sessions. The purpose of the practical session is to facilitate the comprehension of theoretical material, the acquisition of practical skills, the ability to consciously apply knowledge in academic and professional activities, and the development of critical thinking and confidence in forming personal viewpoints. <i>Recommended Practical Topics:</i> 1. Choosing a topic, checking the requirements for the topic. 2. Study of scientific and technical literature and information, expressing the purpose, objectives, object and subject of research. 3. Methodological foundations of scientific knowledge 4. Choosing a direction for scientific research. Formulating a scientific and technical problem. Stages and levels of scientific research.. 5. Formulating a scientific and technical problem. Stages and levels of scientific research.. 6. Stages and levels of scientific research work. 7. Classification of scientific research. 8. Empirical level of scientific research 9. Scientific progress and their level (color) IV. Independent learning and practical exercises Independent learning competency helps students to develop self-improvement skills and increase the efficiency of their professional activities. Students perform independent tasks on their mobile devices under the guidance of a teacher, either in traditional or electronic form. <i>Recommended topics for practical exercises:</i> 1. The concept of modeling and its definition. 2. Procedure for conducting experimental research. 3. Conducting a production experiment. 4. Key recommendations for collecting information. 5. What is active experimentation and how to do it. 6. Scientific methodological foundations. 7. Explain the mathematical model of a two-factor process.
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the

	moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject. INDEPENDENT LEARNING Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students. Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher. In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control. FINAL CONTROL Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform. Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who

	has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor. Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.				
Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria	
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.	
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.	
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.	
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.	
Course assessment criteria and procedure	Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
	Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
			Student activity (in seminars, practical, laboratory classes)	10 points	
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points
			System tasks	10 points (divided by the number of tasks)	
	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points

	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.
Recommended Literature	Main literature: 1. Shermuhammedova H. A., Ilmiy tadqiqot metodologiyasi. Darslik.-T “Fan va texnologiya” 2014.-512b 2. Mirzayev F.P. Ilmiy tadqiqot metodologiyasi. Darslik.-T. 3. Грищук Ю.С., Жилинский В.В. Основы научных исследований и инновационной деятельности.-Минск: БГТУ, 2016.-143. 4. Блинов Ю.И., Васильев А.С., Никаноров А.Н. я доктор. Современные энергосберегающие электротехнологии. Учебное пособие. Издательство СПбГЭТУ «ЛЭТИ», 2001. – 564 с. 5. David V. Thiel Research Methods for Engineers Cambridge University Press 2014 6. Neville A. Engineering Research: Design, Methods, and Application 2007 7. T.M.Letcher Future Energy: Improved, Sustainable and Clean Options for Our Planet Elsevier 2020. 8. J.W.Creswell Research Design: Qualitative, Quantitative, and Mixed Methods Approaches SAGE Publications 2018 Additional literature: 9. Mirziyov Sh.M. Tanqidiy tahlil, qat’iy tartib-intizom va shaxsiy javobgarlik – har bir rahbar faoliyatining kundalik qoidasi bo’lishi kerak. O’zbekiston Respublikasi Vazirlar Mahkamasining 2016 yil yakunlari va 2017 yil istiqbollariga bag’ishlangan majlisidagi O’zbekiston Respublikasi Prezidentining nutqi. // Xalq so’zi gazetasi. 2017 yil 16 yanvar, №11. 10. Mirziyoyev Sh.M. Erkin va farovon, demokratik O’zbekiston davlatini birgalikda barpo etamiz. O’zbekiston Respublikasi Prezidentining lavozimiga kirishish tantanali marosimiga bag’ishlangan Oliy Majlis palatalarining qo’shma majlisidagi nutqi. –T.: “O’zbekiston” NMIU, 2016. – 56 b. 11. Mirziyoyev Sh.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. - T.: “O’zbekiston” NMIU, 2017. – 488 b. 12. The Beginne's Guide to Engineering: Mechanical Engineering, 2013 by Mark Huber. 13. The Electric Power Engineering Handbook, Third Edition - Five Volume Set (Electrical Engineering Handbook), 2012 by Leonard L. Grigsby. 14. Кадиров А.А., Хамудханов М.М. Методы исследования и расчета энерго- ресурсосберегающих режимов работы водоподъемных насосных станций. -Т: «Янги аспр авлоди», 2013. - 120 с. 15. Сипайлов Г.А., Лоос А.В. Математическое моделирование электрических машин. - М.: Высшая школа, 1980. - 176 с. Internet sites: 16. www.gov.uz –Government portal of the Republic of Uzbekistan. 17. www.catback.ru – international scientific articles and educational materials website. 18. www.google.ru – international educational materials search website. 19. www.ziyonet.uz – national educational materials search website. 20. www.lex.uz – national database of legal documents and

	information.
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21. www.catback.ru – scientific articles and educational materials

Name of subject	Modeling energy-efficient devices and systems (ECTS 4)
Subject/module code	ETQTM1304
Science taught semester (s).	2 nd and 3 rd semesters
Responsible teacher	Abdullaev Elnur Akhmatovich, PhD., associate professor.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-120 Audience Training hours – 36 Lecture training hour – 18 Practical training hour – 18 Independent education -84 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is The main goal of the subject is to familiarize master's students with the basics of modeling energy-efficient devices and systems based on modern types, methods and programs; to introduce the types of modeling; to introduce the basics of modeling energy-efficient devices and systems using modern computer programs; to teach ways and methods to reduce energy consumption of industrial devices and systems based on modeling. The objective of the course “Modeling energy-efficient devices and systems” The task of the discipline is to prepare master's students to analyze practical issues, think independently, and make decisions by studying the types and methods of modeling energy-efficient devices and systems, to familiarize them with the scientific results achieved by Uzbek and foreign scientists in this field, and to draw attention to new pedagogical methods in foreign universities. Learning Outcomes: 1. Familiarity with the basics of modeling energy-efficient devices and systems based on modern types, methods and programs; 2. The role and socio-economic importance of electricity in society; 3. Get to know the types of modeling; 4. Familiarity with the basics of modeling energy-efficient devices and systems using modern computer programs; 5. Studying ways and methods to reduce energy consumption of industrial devices and systems based on modeling; 6. Increasing the efficiency of electricity generation equipment; 7. Economic assessment of the competitiveness of traditional and unconventional methods of electricity generation; 8. Knowledge of and ability to use the main legal and regulatory documents available in the field.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topics: 1. Introduction. Purpose and objectives of science. Fundamentals and rules of modeling. Stages of modeling. 2. Informatics and information and communication technologies. Mathematical and physical modeling.. 3. Algorithm and algorithmization issues, construction of modeling algorithms. Programming systems. 4. Principles of energy and resource conservation. Electrical power and technological processes. 5. Energy model of the main power channel of an electric drive. 6. Characteristics and descriptions of widely used asynchronous motors. 7. Energy models of motors.

	8. Principles of saving electricity, resources, and energy efficiency. 9. Saving energy by limiting the duration of operation of the electric motor.. II. Instructions and recommendations for organizing laboratory exercises. Laboratory work is not included in the curriculum III. Practical training instructions and recommendations The instructor's preparation for a practical session begins with the study of initial documents (such as the curriculum, topic schedule, etc.) and concludes with the development of a detailed lesson plan. The instructor must have a clear understanding of the objectives and tasks of the practical session, as well as the amount of work each student is expected to perform. Methodological guidelines serve as the primary instructional document for instructors in preparing and conducting practical sessions. The purpose of the practical session is to facilitate the comprehension of theoretical material, the acquisition of practical skills, the ability to consciously apply knowledge in academic and professional activities, and the development of critical thinking and confidence in forming personal viewpoints. <i>Recommended Practical Topics:</i> 1. Formulate a technical task for modeling an object based on primary data. 2. Study the issues of assembling and calculating a model. 3. Create a mathematical model of an asynchronous motor. Formulate a calculation algorithm for an asynchronous motor 4. Model the frequency control of asynchronous motors. Model the transient processes of asynchronous motors. 5. Model the optimal dynamic modes of asynchronous motors using a computer. 6. Model the working processes of an autonomous inverter - asynchronous motor system. 7. Model a variable frequency asynchronous electric drive system. 8. Create a mathematical model of an asynchronous electric drive powered by a thyristor voltage regulator with speed feedback 9. Get acquainted with the Simulink program interface IIV. Independent learning and practical exercises Independent learning competency helps students to develop self-improvement skills and increase the efficiency of their professional activities. Students perform independent tasks on their mobile devices under the guidance of a teacher, either in traditional or electronic form. Recommended topics for practical exercises: 1. Formulation of the technical task of modeling based on the primary data of the object 2. Familiarization with the Matkad program interface 3. Complete familiarization with the Simulink program interface. 4. Familiarization with the Sim Power System program interface. 5. Building models of Sim Power System Electrical Technological Devices and Systems. 6. Energy-efficient electromechanical devices and systems 7. Numerical modeling methods
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam

	questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject. INDEPENDENT LEARNING Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students. Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher. In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points

	allocated for current and intermediate control. FINAL CONTROL Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform. Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor. Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.				
Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria	
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.	
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.	
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.	
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.	
Course assessment criteria and procedure	Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
	Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
			Student activity (in seminars, practical,	10 points	

			laboratory classes)		
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points
			System tasks	10 points (divided by the number of tasks)	
	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points
	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.				
Recommended Literature	Main literature: - Браславский И.Я. и др. Энергосберегающий асинхронный электропривод-М.: Академия, 2004. - Ильинский Н.Ф., Москаленко В.В. Электропривод электро- и ресурсо-сбережение. - М.: Издательский центр «Академия», 2008 - 208с. - Карамайкин А. С. Моделирование процессов и систем: ГУ АП, 2005. - 110 с. - Dadajonov T. Matlab asoslari. - Fargona: Texnika, 2008. - 631 b. - Muxitdinov M., Dadajonov T. Virtual laboratoriya. -Toshkent.: Fan, 2009. - 579 b. - Xashimov A.A., Mirisayev A.U., Kan L.T. Энергосберегающий асинхронный электропривод. Monografiya. - Tashkent: Fan va texnologiya, 2011. - 132 s. - Хамудханов М.М. Математическое моделирование насосной установки систем электромашиного орошения // Вестник ТашГТУ, 2011. № 1-2. - С. 53-58. - Хамудханов М.М. Насосная станция систем машинного водоподъема как объект управления энерго- и ресурсосбережением // Журнал - Вестник ТашГТУ. - Т., 2013. № 2. С.67-73 - Шрейнер Р.Т. Математическое моделирование электроприводов переменного тока с полупроводниковыми преобразователями частоты. Екатеринбург.: 2000. - 654 с. Additional literature: - Mirziyov Sh.M. Tanqidiy tahlil, qat'iy tartib-intizom va shaxsiy javobgarlik – har bir rahbar faoliyatining kundalik qoidasi bo'lishi kerak. O'zbekiston Respublikasi Vazirlar Mahkamasining 2016 yil yakunlari va 2017 yil istiqbollariga bag'ishlangan majlisidagi O'zbekiston Respublikasi Prezidentining nutqi. // Xalq so'zi gazetasi. 2017 yil 16 yanvar, №11. - Mirziyoyev Sh.M. Erkin va farovon, demokratik O'zbekiston davlatini birgalikda barpo etamiz. O'zbekiston Respublikasi Prezidentining lavozimiga kirishish tantanali marosimiga bag'ishlangan Oliy Majlis palatalarining qo'shma majlisidagi nutqi. –T.: “O'zbekiston” NMIU, 2016. – 56 b. - Mirziyoyev Sh.M. Buyuk kelajagimizni mard va olijanob xalqimiz bilan birga quramiz. - T.: “O'zbekiston” NMIU, 2017. – 488 b. - Эфимов А.А. Обобщенный подход к моделированию систем электропривода переменного тока. Вестник Красноярского государственного университета. - Красноярск.: 1998. с. 172-182.				

14. The Beginne's Guide to Engineering: Mechanical Engineering, 2013 by Mark Huber.
15. The Electric Power Engineering Handbook, Third Edition - Five Volume Set (Electrical Engineering Handbook), 2012 by Leonard L. Grigsby.
16. M.M. Khamudkhanov. Formal model of water elevating pump installation and research on influence of a number of factors on power efficiency of its functioning.// Seventh World Conference on Intelligent Systems for Industrial Automation, WCIS -2012. P 115-121.
17. M.M. Khamudkhanov. Resource-Saving Model for Formation of Water Consumption Schedule For Seed Culture of Irrigated Agrolandscapes.// The III International Conference on Multimedia Information Technology and Applications (MITA - 2015). P 433-437.
18. Хамудханов М.М. Формирование энергосберегающей режимной карты, функционирования насосной станции систем машинного водоподъема // Проблемы энерго- и ресурсосбережения, 2012. № 1-2. - С. 136- 143.
19. Кадиров А.А., Хамудханов М.М. Методы исследования и расчета энерго- ресурсосберегающих режимов работы водоподъемных насосных станций. -Т: «Янги аср авлоди», 2013. - 120 с.
20. Сипайлов Г.А., Лоос А.В. Математическое моделирование электрических машин. - М.: Высшая школа, 1980. - 176 с.

Internet sites:

21. www.gov.uz –Government portal of the Republic of Uzbekistan.
22. www.catback.ru – international scientific articles and educational materials website.
23. www.google.ru – international educational materials search website.
24. www.ziyonet.uz – national educational materials search website.
25. www.lex.uz – national database of legal documents and information.
26. www.catback.ru – scientific articles and educational materials

Name of subject	Energy saving in heat energy (ECTS 10)
Subject/module code	IEET1110
Science taught semester (s).	1 st and 2 nd semesters
Responsible teacher	Nazarov Furkat Daminovich (PhD), senior teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-300 Audience Training hours - 90 Lecture training hour – 46 Practical training hour – 44 Independent education -210 hours
ECTS	10
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to “Energy saving in heat energy” is to teach the formation of skills to determine the types of secondary energy sources in industrial enterprises, their potential, types of use of the heat of gases coming out of heat technology devices, energy and exergy indicators of heat use, types of energy-technological aggregates and their efficiency. The task of the subject is to are the types and reserves of secondary energy sources generated in energy, energy-technological devices and technologies in industrial enterprises, analysis of the characteristics and potentials of the exit gases of heat technology devices, drawing up the energy and exergy balance of heat technology devices, methods of calculating efficiency, waste consists in mastering the principles of heat utilization. Learning outcomes: 1. Having an idea about the systematic analysis in solving organizational and technical issues in the management of the energy industry of objects. 2. The importance of how to form an energy passport. 3. Develop energy efficient design proposals that meet energy efficiency requirements. 4. To know and be able to use the methods of evaluating the good or bad, social, economic, ecological and technical consequences of the decisions being made. 5. The main performance indicators and options for their improvement in different types of energy devices. 6. Increasing the efficiency of energy equipment. 7. Economic assessment of service quality and its competitiveness by types of energy devices. 8. To know and be able to use the existing main legal and regulatory documents in the field
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Introduction. Types and potentials of secondary energy sources Topic 2: Types of disposal of heat of gases emitted from technological devices. Topic 3: The use of outgoing heat for internal regenerative, external technological and energy purposes. Topic 4: Classification of boilers-utilizers, that is, boilers that re-use the heat of exhaust gases Topic 5: Decontamination of slurries of metallurgical production by fire

Topic 6: Gas turbine boiler-utilizers.

Topic 7: Water-pipe boiler-utilizers. Structural elements of water-pipe boiler-utilizers

Topic 8: Boiler-utilizers of sulfur-torch burning furnaces

Topic 9: Dry cox quenching device.

Topic 10: Boiler-utilizers of steel melting and rolling production.

Topic 11: Electrotechnological combination in pulp and paper production.

Topic 12: Electrotechnological combination in blast furnace and hydrogen production.

Topic 13: Cooling of structural elements of high-temperature devices.

Topic 14: Disposal of used steam.

Topic 15: Disposal of low-potential heat waste

Topic 16: Disposal of low-potential flue gases.

Topic 17: Steam-gas devices.

Topic 18: Steam-gas plant with steam injection.

Topic 19: Energy efficiency in industry.

Topic 20: Heat supply from compressor devices disposal devices.

Topic 21: Energy saving in the gas industry (compressor industry).

Topic 22: Types of losses in the boiler room and their calculation method.

Topic 23: Energy saving in heat supply systems.

II. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Calculation of the total heat content of waste gases.
2. Determination of fuel savings when using waste gas heat.
3. Calculation of the combustion process in use of exhaust gases containing combustible gases
4. Energy saving when low-temperature heat carrier is disposed.
5. Energy saving in the use of a steam-gas device.
6. Calculation of energy saving potentials in hot water, steam production and distribution systems.
7. Assessment of energy consumption by gas heating devices.
8. Energy saving in the use of heat pumps.
9. Calculation of technical and economic efficiency of energy-saving measures.

III. Independent learning and independent work.

Independent learning competence serves to support students' independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form.

Recommended topics for independent study:

1. Energy saving reserves and energy saving measures in various industries.

	2. World experience of using new energy-efficient technologies in industry. 3. Thermal power plants. Thermal power centers.. 4. Determination and adjustment of efficiency of heat exchange devices used in industry. 5. The method of transferring the mode switch of the boiler device (making a mode card). 6. Compilation of exergy balances of heat-consuming devices. 7. Thermal schemes and efficiency of modern steam and gas plants. 8. Application of new energy-efficient technologies in industrial heat supply systems. 9. Disposal of the heat of combustion products. 10. Disposal of low-potential flue gases. 11. Heat supply from compressor devices disposal devices. 12. Energy efficiency in the gas industry (compressor industry). 13. Calculation of the total heat content of waste gases 14. Determination of fuel savings when using waste gas heat 15. Energy saving in steam and hot water supply systems 16. Electrotechnological combination in blast furnace and hydrogen production 17. Disposal of the heat of combustion products 18. Disposal of low-potential flue gases 19. Heat supply from compressor devices disposal devices 20. Energy efficiency in the gas industry (compressor industry). 21. Energy saving in boiler rooms 22. Energy saving in heat supply systems 23. Reduction of heat loss through the use of double-chamber window-frames in the construction of buildings 24. Infrared heating system of industrial facilities 25. Moist air and moist combustion products 26. Steam-gas plant with steam injection 27. Calculation of energy saving potentials in hot water and steam production and distribution systems 28. Assessment of energy consumption by gas heating devices 29. Energy saving in the use of heat pumps 30. Calculation of technical and economic efficiency of energy-saving measures 31. Calculation of technical and economic efficiency of energy-saving measures 32. Energy saving in heat supply systems
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted

	for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject. INDEPENDENT LEARNING Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students. Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher. In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control. FINAL CONTROL Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform. Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of

	"0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor. Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.				
Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria	
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.	
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.	
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.	
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.	
Course assessment criteria and procedure	Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
	Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
			Student activity (in seminars, practical, laboratory classes)	10 points	
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points
			System tasks	10 points (divided by the number of tasks)	
	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points
	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work				

	assignments are evaluated as system assignments through the electronic platform.
Recommended Literature	Main literature: 1. Shaislamov A.SH., Matchanov E.K., Energetika va texnologiyalarda issiqlikdan foydalanish., Ma'ruza matnlari., 2000. 2. Allaev K.R., Xoshimov F.A.. Знегросбережения на промышленных предприятиях. Tashkent: Izd-vo «Fan» AN RUz, 2011. - 208s. 3. Безлепкии В.П. Парогазове и паротурбинне установки электростансий. СПб.: Изд-во СПбГТУ, 1997. 295 с. 4. Цанеев С.В. Газотурбинне и парогазове установки тепловх электростансий: учебное пособие для вузов/ 5. С.В. Санеев, В.Д. Буров, А.Н. Ремезов; под ред. С.И. Цанаева. М.: Изд-во МЕИ, 2002. 584 с. 6. Фаворский О.Н. Технологические схем и показатели экономичности ПГУ с впрском пара в газовой тракт/О.Н. Фаворский, С.В. Санеев, В.Д. Буров, Д.В. Карташов// Теплоэнергетика. 2005. №4. С. 28 - 34. 7. Об исползовании теплоты выхлопных газов газоперекачивающих агрегатов магистральных газопроводов: тр. XIУ школы-семинара молодых ученых и спетсиалистов под рук. акад. РАН А.И. Леонтева/А.П. Баскаков [и др.]. М. Изд-во МЕИ, 2003. Т.2. С.349-352. 8. Рациональное исползование газа в енергетических установках : справочное руководство/ Р.Б. Ахмедов [и др.]. ЖЛ: Недра, 1990. 423 с. 9. А.П. Воинов. Л.И. Купермен, С.П. Сушон. Парове котл на отходящих газах. Киев. Всшая школа. 1983. 10. Сазонов Б.В. Теплоэнергетические систем промышленнх предприятий. Б.В. Сазонов, В.И. Ситас. М.: Энергоатомиздат, 1990. 11. Кузнецов Ю.В. Сжатй воздух. Ю.В. Кузнецов, М.Ю. Кузнецов. Екатеринбург: УрО РАН, 2003. 12. «Правила проведения енергетического аудита и енергетических экспертиз потребителей ТЕР». Постановление Кабинета Министров РУз №164 07.08.2006 г. 13. Правила ползования тепловой энергией. Ташкент: Узгосэнергонадзор, 2005. 14. Правила ползования электрической энергией. Ташкент: Узгосэнергонадзор, 2005. 15. Колесников А.И., Федоров М.Н., Варфоломеев Yu.M.. Энегросбережение в промышленнх и коммуналнх предприятиях. М.: Инфра- М, 2005. 16. Вайне с. Турнер, Стеве Дотй. Энеггй манеамент Хандбоок. ИСБН: 0-88173-542-6 (принт) -0-88173-543-4 (электронис).2006. 909 17. А.П. Воинов, Л.И. Купермен, С.П. Сушон. “Паровие котли на отходящих газах, Киев 1983. 18. Журнал «Проблемы энерго- и ресурсосбережения». - Ташкент: Издательство ТашГТУ. №№ И -4, 2003 г. и последующие выпуски. 19. Правила ползования тепловой энергией. Ташкент: Узгосэнергонадзор, 2005. 20. Shaislamov A.SH., Matchanov E.K., Energetika va texnologiyalarda issiqlikdan foydalanish., Ma'ruza matnlari., 2000. 21. Allaev K.R., Xoshimov F.A.. Знегросбережения на промышленных предприятиях. Tashkent: Izd-vo «Fan» AN RUz, 2011. - 208s. 22. Безлепкии В.П. Парогазове и паротурбинне установки электростансий. СПб.: Изд-во СПбГТУ, 1997. 295 с. 23. Цанеев С.В. Газотурбинне и парогазове установки тепловх

электростанций: учебное пособие для вузов/

24. С.В. Санеев, В.Д. Буров, А.Н. Ремезов; под ред. С.И. Цанаева. М.: Изд-во МЕИ, 2002. 584 с.

25. Фаворский О.Н. Технологические схем и показатели экономичности ПГУ с впрсом пара в газовой тракт/О.Н. Фаворский, С.В. Санеев, В.Д. Буров, Д.В. Карташов// Теплоэнергетика. 2005. №4. С. 28 - 34.

26. Об использовании теплоты выхлопных газов газоперекачивающих агрегатов магистральных газопроводов: тр. XIУ школы-семинара молодых ученых и спетсиалистов под рук. акад. РАН А.И. Леонтева/А.П. Баскаков [и др.]. М. Изд-во МЕИ, 2003. Т.2. С.349- 352.

27. Рациональное использование газа в енергетических установках : справочное руководство/ Р.Б. Ахмедов [и др.]. ЖЛ: Недра, 1990. 423 с.

28. А.П. Воинов. Л.И. Купермен, С.П. Сушон. Парове котл на отходящих газах. Киев. Всшая школа. 1983.

29. Сазонов Б.В. Теплоэнергетические систем промышленных предприятий. Б.В. Сазонов, В.И. Ситас. М.: Енергоатомиздат, 1990.

30. Кузнецов Ю.В. Сжатй воздух. Ю.В. Кузнецов, М.Ю. Кузнецов. Екатеринбург: УрО РАН, 2003.

31. «Правила проведения энергетического аудита и энергетических экспертиз потребителей ТЕР». Постановление Кабинета Министров РУз №164 07.08.2006 г.

32.Правила ползования тепловой энергией. Ташкент: Узгосэнергонадзор, 2005.

Internet resources:

33. www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan.

34. www.ziyonet.uz – national educational materials search site.

35. www.gov.uz – Government portal of the Republic of Uzbekistan.

36. www.google.com – international educational materials search site.

37. www.energystrategy.ru – “Energy Policy and Strategy” information portal

38. www.twirpx.com – international educational materials search site.

Name of subject	Energy audit measurements and tools (ECTS 10)
Subject/module code	EAO'A2310
Science taught semester (s).	2 nd and 3 rd semesters
Responsible teacher	Nazarov Furkat Daminovich (PhD), senior teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-300 Audience Training hours - 90 Lecture training hour – 46 Practical training hour – 44 Independent education -210 hours
ECTS	10
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to the main goal of “Energy audit measures and tools” is to teach students the basic essence of energy conservation policy, to use energy wisely, to normalize consumption in energy forms, to manage energy savings, to use secondary energy resources, to implement energy saving measures in practice and to generate the skill of using energy. The task of the subject is to are the types and reserves of secondary energy sources generated in energy, energy-technological devices and technologies in industrial enterprises, analysis of the characteristics and potentials of the exit gases of heat technology devices, drawing up the energy and exergy balance of heat technology devices, methods of calculating efficiency, waste consists in mastering the principles of heat utilization. Learning outcomes: 1. The ability of enterprises to get an idea in a systematic taxable framework in solving organizational and technical issues in the management of the enrtgetic economy. 2. The importance of how to form an energy passport of enterprises. 3. Development of energy efficient slurry proposals that meet energy efficiency requirements. 4. To know and be able to use the technical parameters of Energoaudit measuring instruments. 5. The main performance indicators and options for their improvement in different types of energy devices. 6. Energetic equipment improve work productivity. 7. Study of Energoaudit measuring instruments. 8. Be able to know and use the existing basic legal and regulatory documents in the field
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of instrumental energy audit in enterprises Topic 2: Methodology and basic principles of energy audit. Topic 3: Types and methods of measurements in instrumental energy audit. Topic 4: Normalizing electricity consumption in enterprises Topic 5: Current energy consumption status.Statistical reports Topic 6: Direct measurement of energy and energy carrier consumption. Topic 7: Partial and indirect measurement of energy and energy carrier consumption parameters Topic 8. Energetik balans va uning turlari Topic 9: Methods and equipment for conducting energy audits. Topic 10: Boiler-utilizers of steel melting and rolling production. Topic 11: Calculation of heat energy consumption by consumers.

Topic 12: General terms of modern measuring instruments necessary for conducting energy research and energy auditing.

Topic 13: Modern measuring instruments for determining power, electricity, quality and phase difference.

Topic 14: Modern measuring instruments for energy audits in heating systems.

Topic 15: Modern measuring instruments for energy audits of pumping units

Topic 16: Modern measuring instruments for energy tracking in lighting devices.

Topic 17: Modern measurement instruments for energy audits in compressed air systems.

Topic 18: Modern measuring instruments for energy audits of air exchange (ventilation) systems of enterprises and organizations.

II. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Types and procedure of energy research
2. Energy audit of technical systems of enterprises
3. Calculation of the total heat content of waste gases.
4. Determination of fuel savings when using waste gas heat.
5. Calculation of the combustion process in use of exhaust gases containing combustible gases
6. Energy saving when low-temperature heat carrier is disposed.
7. Energy saving in the use of a steam-gas device.
8. Calculation of energy saving potentials in hot water, steam production and distribution systems.
9. Assessment of energy consumption by gas heating devices.
10. Energy saving in the use of heat pumps.
11. Calculation of technical and economic efficiency of energy-saving measures.
12. Power quantity and quality analyzer device
13. Parameters of the device temperature measurement equipment

III. Independent learning and independent work.

Independent learning competence serves to support students' independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form.

Recommended topics for independent study:

1. General rules and legal framework
2. Energy audits and organization of energy audit
3. Rights and responsibility during energy audit
4. Requirements of consumers of fuel and energy resources
5. General concepts of the necessary modern measuring instruments for energy inspection and energy audit
6. Modern measuring devices for determining power, electricity, quality

	and phase voltage difference. 7.Modern measuring devices for energy audits in heat supply systems. 8.Modern measuring instruments for energy audits in pumping units 9.Modern measuring instruments for energy audits in lighting devices 10.Modern measuring instruments for energy audits in compressed air systems 11.Modern measuring instruments for energy audit in air exchange (ventilation) systems of enterprises and organizations 12.First level energy survey 13.Energy survey of the second level (in-depth energy survey) 14.Types and order of energy surveys 15.Development of a program for energy audits and energy audits and the procedure for registration. 16.Energy audit of power supply systems: energy losses in power grids; energy losses in transformers; energy losses in electric motors 17.Energy audit in pumping unit systems 18.Energy audit in heat supply systems 19.Energy audit in lighting systems 20.Energy audit in air exchange (ventilation) systems of enterprises 21.Energy audit in compressed air systems of enterprises and organizations 22.Electricity balance 23.Methods of economic valuation in water consumption systems 24.The procedure for the development and economic assessment of energy saving 25.The procedure for preparing the final energy audit report
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed

through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc.

Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects.

MIDTERM CONTROL

Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course.

Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject.

INDEPENDENT LEARNING

Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students.

Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control.

FINAL CONTROL

Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria		
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.		
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.		
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.		
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.		
Course assessment criteria and procedure	Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score	
	Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points	
			Student activity (in seminars, practical, laboratory classes)	10 points		
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points	
			System tasks	10 points (divided by the number of tasks)		
	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points	
	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.					
	Recommended Literature					
Main literature: 1. Energiya nazorati va yoqilg'i-energetika resurslari iste'molchilarining ekspertizalarini o'tkazish qoidalari. O'zbekiston Respublikasi Vazirlar Mahkamasining 2006 yil 7 avgustdagi 164-sonli qarori. 2.Allaev K.R., Xoshimov F.A.. Энергосбережения на промышленных предприятиях. Tashkent: Izd-vo «Fan» AN RUz, 2011. - 208s. 3.Безлепкии В.П. Парогазове и паротурбинне установки электростансий. СПб.: Изд-во СПбГТУ, 1997. 295 с.						

- 4.Цанеев С.В. Газотурбинные и парогазовые установки тепловых электростанций: учебное пособие для вузов/
- 5.С.В. Санеев, В.Д. Буров, А.Н. Ремезов; под ред. С.И. Цанаева. М.: Изд-во МЕИ, 2002. 584 с.
- 6.Фаворский О.Н. Технологические схемы и показатели экономичности ПГУ с впрыском пара в газовый тракт/О.Н. Фаворский, С.В. Санеев, В.Д. Буров, Д.В. Карташов// Теплоэнергетика. 2005. №4. С. 28 - 34.
- 7.Об использовании теплоты выхлопных газов газоперекачивающих агрегатов магистральных газопроводов: тр. XIУ школы-семинара молодых ученых и специалистов под рук. акад. РАН А.И. Леонтева/А.П. Баскаков [и др.]. М. Изд-во МЕИ, 2003. Т.2. С.349-352.
8. Рациональное использование газа в энергетических установках : справочное руководство/ Р.Б. Ахмедов [и др.]. ЖЛ: Недра, 1990. 423 с.
9. А.П. Воинов. Л.И. Купермен, С.П. Сушон. Паровые котлы на отходящих газах. Киев. Высшая школа. 1983.
10. Сазонов Б.В. Теплоэнергетические системы промышленных предприятий. Б.В. Сазонов, В.И. Ситас. М.: Энергоатомиздат, 1990.
11. Кузнецов Ю.В. Сжатый воздух. Ю.В. Кузнецов, М.Ю. Кузнецов. Екатеринбург: УрО РАН, 2003.
12. «Правила проведения энергетического аудита и энергетических экспертиз потребителей ТЕР». Постановление Кабинета Министров РУз №164 07.08.2006 г.
13. Правила пользования тепловой энергией. Ташкент: Узгосэнергонадзор, 2005.
14. Правила пользования электрической энергией. Ташкент: Узгосэнергонадзор, 2005.
15. Колесников А.И., Федоров М.Н., Варфоломеев Ю.М.. Энергосбережение в промышленных и коммунальных предприятиях. М.: Инфра- М, 2005.
16. Вайне с. Турнер, Стеве Дотй. Энергий менеджмент Ҳандбоок. ИСБН: 0-88173-542-6 (принт) -0-88173-543-4 (электроник).2006. 909
17. А.П. Воинов, Л.И. Купермен, С.П. Сушон. “Паровые котлы на отходящих газах, Киев 1983.
18. Журнал «Проблемы энерго- и ресурсосбережения». - Ташкент: Издательство ТашГТУ. №№ И -4, 2003 г. и последующие выпуски.
19. Правила пользования тепловой энергией. Ташкент: Узгосэнергонадзор, 2005.
20. Shaislamov A.SH., Matchanov E.K., Energetika va texnologiyalarda issiqlikdan foydalanish., Ma’ruza matnlari., 2000.
21. Allaev K.R., Xoshimov F.A.. Энергосбережения на промышленных предприятиях. Tashkent: Izd-vo «Fan» AN RUz, 2011. - 208s.
22. Безлепкина В.П. Парогазовые и паротурбинные установки электростанций. СПб.: Изд-во СПбГТУ, 1997. 295 с.
23. Цанеев С.В. Газотурбинные и парогазовые установки тепловых электростанций: учебное пособие для вузов/
24. С.В. Санеев, В.Д. Буров, А.Н. Ремезов; под ред. С.И. Цанаева. М.: Изд-во МЕИ, 2002. 584 с.
25. Фаворский О.Н. Технологические схемы и показатели экономичности ПГУ с впрыском пара в газовый тракт/О.Н. Фаворский, С.В. Санеев, В.Д. Буров, Д.В. Карташов// Теплоэнергетика. 2005. №4. С. 28 - 34.
26. Об использовании теплоты выхлопных газов газоперекачивающих агрегатов магистральных газопроводов: тр.

ХІУ школы-семинара молодых ученых и спетсиалистов под рук. акад. РАН А.И. Леонтева/А.П. Баскаков [и др.]. М. Изд-во МЕИ, 2003. Т.2. С.349- 352.

27. Рациональное исползование газа в енергетических установках : справочное руководство/ Р.Б. Ахмедов [и др.]. ЖЛ: Недра, 1990. 423 с.

28. А.П. Воинов. Л.И. Купермен, С.П. Сушон. Парове котл на отходящих газах. Киев. Всшая школа. 1983.

29. Сазонов Б.В. Теплоенергетические систем промышленных предприятий. Б.В. Сазонов, В.И. Ситас. М.: Енергоатомиздат, 1990.

30. Кузнецов Ю.В. Сжатй воздух. Ю.В. Кузнецов, М.Ю. Кузнецов. Екатеринбург: УрО РАН, 2003.

31. «Правила проведения енергетического аудита и енергетических экспертиз потребителей ТЕР». Постановление Кабинета Министров РУз №164 07.08.2006 г.

32.Правила ползования тепловой энергией. Ташкент: Узгосенергонадзор, 2005.

Internet resources:

33. www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan.

34. www.ziyonet.uz – national educational materials search site.

35. www.gov.uz – Government portal of the Republic of Uzbekistan.

36. www.google.com – international educational materials search site.

37. www.energystrategy.ru – “Energy Policy and Strategy” information portal

38. www.twirpx.com – international educational materials search site.

Name of subject	Energy audit of industrial enterprises (ECTS 12)
Subject/module code	SKEA1212
Science taught semester (s).	2 nd and 3 rd semesters
Responsible teacher	Nazarov Furkat Daminovich, PhD., senior teacher.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-360 Audience Training hours – 108 Lecture training hour – 54 Practical training hour – 54 Independent education -252 hours
ECTS	12
The purpose and tasks of subject / learning outcomes	The goal of teaching the subject is to teach students the fundamentals of rational use of energy, standardization of consumption by energy form, energy conservation management, use of secondary energy resources, and the implementation of energy conservation policies in practice. The task of the discipline is to evaluate methods for controlling current energy consumption at a facility, study energy management processes and practices, energy management information systems, energy audit methods, develop measures to increase energy efficiency, and study their feasibility. Learning outcomes: 1. Study the history and prospects of the development of the electric power system. 2. Get acquainted with the role and socio-economic significance of electric power in society. 3. Study the state policy of the energy sector and its development trends and prospects in the country and the world. 4. To have an idea of systematic analysis in solving organizational and technical issues in managing the energy sector of industrial enterprises. 5. Study of key performance indicators for various types of energy devices and opportunities for their improvement. 6. Economic assessment of service quality and its competitiveness by type of energy devices. 7. Knowledge of and ability to use the main legal and regulatory documents available in the field.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of instrumental energy audit at industrial enterprises Topic 2: Types and methods of measurements in instrumental energy audit Topic 3: Insulators and line fittings. Cable structure and cable lines. Topic 4: Standardization of electrical energy consumption at industrial enterprises Topic 5: Current state of energy consumption. Statistical reports. Topic 6: Direct measurement of energy and energy carrier consumption Topic 7: Partial and indirect measurement of energy and energy carrier consumption parameters Topic 8: World experience in the application of new energy-saving technologies in industry Topic 9: Assessment of electricity consumption by lighting systems and electrical appliances

Topic 10: Assessment of electricity consumption by air conditioners and office equipment

Topic 11: Calculation of heat energy consumption by consumers

Topic 12: Energy balance and its types

Topic 13: Methods and equipment for conducting energy audits

Topic 14: Definitions for heat and electricity

Topic 15: Calculation of electricity consumption by consumers

Topic 16: Accounting for natural gas by consumers

Topic 17: Heat and gas supply systems of industrial enterprises

Topic 18: Energy saving due to reactive power compensation

Topic 19: Cross-sectional audit of energy consumption

Topic 20: Analysis of the efficiency of energy consumption at the facility

Topic 21: Definition of enterprises and buildings

Topic 22: Feasibility study of energy-saving measures

Topic 23: Development of energy-saving recommendations

Topic 24: Analysis of energy use by the end consumer.

II. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Application of new energy-saving technologies in industrial heat supply systems
2. Assessment of energy consumption by electric heating and cooling devices
3. Assessment of energy consumption by steam heating devices
4. Steam-gas device with steam spraying
5. Energy efficiency in industry
6. Heat supply in compressor equipment utilization devices
7. Energy saving in the gas industry
8. Energy saving in boiler houses
9. Operating modes of boiler plants
10. Energy saving in heat supply systems
11. Reducing heat loss through the use of double-chamber windows
12. Infrared heating system for industrial facilities.

III. Independent learning and independent work.

Independent learning competence serves to support students' independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form.

Recommended topics for independent study:

1. Comparison of energy consumption data
2. Cross-sectional energy consumption audit
3. Analysis of energy consumption efficiency at the facility
4. Description of the enterprise and buildings
5. Feasibility study of energy saving measures
6. Development of energy saving recommendations

	7. Analysis of energy use by the end consumer 8. Energy distribution and energy conversion 9. Development and evaluation of energy consumption improvement projects 10. Energy saving in heat supply systems 11. Saving electricity using reactive power compensation 12. Feasibility study of energy saving measures 13. Development of energy saving recommendations 14. Analysis of energy use by the end consumer 15. Energy distribution and energy conversion 16. Development and evaluation of energy consumption improvement projects 17. Energy saving in heat supply systems 18. Reducing heat loss through the use of double-chamber windows 19. Energy saving in electrical networks.
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and

level of mastery of lecture material after completing the relevant section of the course.

Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject.

INDEPENDENT LEARNING

Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students.

Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control.

FINAL CONTROL

Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in

				practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.	
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.	
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.	
Course assessment criteria and procedure	Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
	Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
			Student activity (in seminars, practical, laboratory classes)	10 points	
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points
			System tasks	10 points (divided by the number of tasks)	
	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points
	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.				
Recommended Literature	Main literature: 1. Steven W.Blume. Electric Power System Basics. USA.: Wiley – Interscience A John Wiley&Sous, INC Publication, 2007, 260 p 2. Липкин Б.Ю., "Электроснабжение промышленных предприятий и установок", Учебник. -М.: "Высшая школа", 1980. 3. Кудрин Б.И., Электроснабжения промышленных предприятий. Учебник. -М.: Интермет Инжиниринг, 2005. 4. Qodirov T.M., Alimov H.A., «Sanoat korxonalari elektr ta'minoti», O'quv qo'llanma, ToshDTU. -T.: 2006. 5. Qodirov T.M., Alimov H.A., «Sanoat korxonalari va fuqoro binolarining elektr ta'minoti», O'quv qo'llanma, ToshDTU. -T.: 2007. 6. Taslimov A.D., Rasulov A.N., Usmonov E.G., elektr ta'minoti», O'quv qo'llanma Электр таъминоти. Ilm-ziyo. -T.: 2012.				
	Additional literature: 7. O'zbekiston Respublikasini yanada rivojlantirish bo'yicha Harakatlar strategiyasi to'grisida-T.2017yil 7 fevral,PF-4947-sonli Farmoni. 8. Uzbekistan Respublikasi «Energiyadan oqilona foydalanish togrisida» qonuni. 2019 y. 9. Конюхова Е.А., Электроснабжение объектов: Учебное пособие. -М.: Издательство «Мастерство»; Высшая школа, 2001.				

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| | <p>10. Ополева Г.Н., Схемы и подстанции электроснабжения: Справочник: Учебное пособие. - М.: ФОРУМ: ИНФРА-М, 2006.</p> <p>11. Гулямов Б.Х., Салиев А.Г., Ташпулатов Б.Т., Тешабаев Б.М., Правила устройства электроустановок. Узгосэнергонадзор. -Т.: 2007.</p> <p>12. Аллаев К.Р., Энергетика мира и Узбекистана. Аналитический обзор. -Т.: Издательство «Молия», 2007.</p> <p>13. Аллаев К.Р., Электроэнергетика Узбекистана и мира. -Т.: «Фан ва технология», 2009.</p> <p>Internet resources:</p> <p>16. www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan.</p> <p>17. www.ziyonet.uz – national educational materials search site.</p> <p>18. www.gov.uz – Government portal of the Republic of Uzbekistan.</p> <p>19. www.google.com – international educational materials search site.</p> <p>20. www.energystrategy.ru – “Energy Policy and Strategy” information portal</p> <p>21. www.twirpx.com – international educational materials search site.</p> |
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Name of subject	Energy management (ECTS 6)
Subject/module code	EM1106
Science taught semester (s).	1 st semester
Responsible teacher	Abdullaev Elnur Akhmatovich (PhD), associate professor.
Education language	Uzbek
Connection to the curriculum	Compulsory
Training hours (this including independent education)	Total hours-180 Audience Training hours – 54 Lecture training hour – 28 Practical training hour – 26 Independent education -126 hours
ECTS	6
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to teach the main concepts of energy management in the consumption of electric energy, in the efficient use of energy, in the standardization of consumption by energy forms, in automated control systems, in the use of secondary energy resources, the fundamental nature of the ongoing energy saving policy. is to create skills on the role and importance of energy management in teaching and implementing energy saving measures in practice. The task of the subject is to teach energy management, to regulate consumption by energy forms, to use secondary energy resources, to teach students information about the technical and economic efficiency of introducing energy management in household, public and industrial enterprises. consists of. Learning outcomes: 1. Development of measures to increase and popularize energy efficiency 2. Identification and elimination of power loss in the electricity supply system 3. Role of energy management in society and socio-economic importance 4. Study of energy management using modern computer programs 5. Studying the technical and economic indicators of energy management, their place in ecology and the principles of use 6. Ability to perform energy monitoring 7. Acquaintance with the mains of energy management 8. To know and be able to use the existing main legal and regulatory documents in the field
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Relevance of energy consumption issues Topic 2: Energy management system. Topic 3: Enterprise as an energy circulation system Topic 4: Energy flows of production Topic 5: Assessment of employee labor costs Topic 6: Dynamic energy capacity and its recession Topic 7: Factors affecting energy consumption of the enterprise Topic 8: Energy consumption of the enterprise depending on the volume of production Topic 9: Providing data for analysis Topic 10: Enterprise energy management system databases Topic 11: The content of the database of the enterprise's energy management system

Topic 12: Main components of energy management and stages of development

Topic 13: Encouraging the employees of the enterprise in the field of energy saving

Topic 14: Development of energy saving measures

II. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Calculation of electrical energy consumption
2. Energy balance of industrial enterprises
3. Issues of energy saving by compensation of reactive power in industrial enterprises
4. Tariffs for heat and electrical energy
5. Calculation of energy savings by using non-traditional energy sources in the energy supply of consumers
6. Calculation of the amount of payment according to the forms of consumed energy
7. The procedure for drawing up documents for connecting consumers to electricity networks
8. Rights and obligations of electricity consumers
9. Discounts and increases in electricity tariff for reactive energy compensation
10. Calculation and selection of cross-sectional areas of overhead lines and cables
11. Calculation and selection of the number and power of transformers

III. Independent learning and independent work.

Independent learning competence serves to support students' independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form.

Recommended topics for independent study:

1. Concept and structure of energy management
2. Overview of the ISO-50001 International Standard
3. Established definitions and prices for electricity consumption
4. Energy and power losses in the power supply system
5. General information on forecasting and regulation of electricity consumption
6. Concept and structure of energy audit, types of energy audit
7. Energy balance and its types
8. Compilation of energy passport of industrial enterprises and buildings
9. Concept of energy monitoring and stages of conducting energy monitoring
10. Main concepts and energy service contracts in the field of energy service
11. Fundamentals of investment project management and project change management in energy efficiency

	12. Informational and marketing management of energy management and economic evaluation of energy efficiency 13. Estimating the economic efficiency of investments in energy saving measures 14. Calculation of energy consumption during energy audit 15. Study of graphs of electrical loads of industrial enterprises 16. Fundamentals of evaluating the technical and economic efficiency of energy saving measures 17. Stages of energy monitoring. Checking of energy monitoring indicators.
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject.

Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject.

INDEPENDENT LEARNING

Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students.

Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control.

FINAL CONTROL

Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can

				express, and narrate the essence of the subject, and has an idea about the subject.	
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.	
Course assessment criteria and procedure	Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
	Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
			Student activity (in seminars, practical, laboratory classes)	10 points	
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points
			System tasks	10 points (divided by the number of tasks)	
	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points
	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.				
Recommended Literature	Main literature: 1. Law of the Republic of Uzbekistan “On electric energy”. Received June 24, 2009. 2. International standard ISO 50001. Energy management systems. Requirements and instructions for use. - SPb., 2011. 3. State standard ISO 50001-2012. Energy management systems. National norm. Requirements and ISO 50001: 2011. Guidance on the application of energy management systems - Requirements with an Operation Guide (IDT). 4. Makoklyuev, BI Energiya iste'molini tahlil qilish va rejalashtirish. M.: Energoatomizdat, 2008. 296 b. 5. Chuvilkin, A.V., Gordeev A.S. Sun'iy neyron tarmoqlardan foydalangan holda ob'ektlarning quvvat sarfini bashorat qilish // Zamonaviy fan va amaliyot savollari. 2008-yil. № 2 (12). Bb. 32-37. 6. Anarboyev A. I., Qodirov D. B. Energiya auditi. Study guide, TIQXMMI, 2023. 187 b. 7. Energy audits. Practical guide for more energy efficient business. 8. General Aspects of Energy Management and Energy Audit. Additional literature: 1. Mirziyoyev Sh.M. Yangi O'zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b. 2. Mirziyoyev Sh.M. Milliy taraqqiyot yo'limizni qati'yat bilan davom ettirib yangi bosqichga ko'taramiz .–T.:“O'zbekiston”, 2017– 592 b 3. Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 “On the Development Strategy of New Uzbekistan for 2022-2026”.				

	4. Decree of the President of the Republic of Uzbekistan No. PF-220 dated 09.09.2022 “On additional measures for the introduction of energy-saving technologies and the development of small-capacity renewable energy sources”. 5. General Aspects of Energy Management And Energy Audit. Guide Book For National Certification Examination For Energy Auditors and Managers. 6. Xoshimov F.A., Taslimov A.D. Energiya tejamkorligi asoslari. O‘quv qo‘llanma. – T.: “Voriz”, 2014 – 192 bet. 7. Аллаев К.Р., Хошимов Ф.А. Энергосбережение в промышленных предприятиях, Монография. – Т.:Fan. 2012. 8. Киямов И.К. Алафузов И.Г. Ключевые принципы энергетического менеджмента в энергосбережении. Вестник экономики, права и социологии, 2016, № 1 Internet resources: www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan. www.ziynet.uz – national educational materials search site. www.gov.uz – Government portal of the Republic of Uzbekistan. www.google.com – international educational materials search site. www.energystrategy.ru – “Energy Policy and Strategy” information portal www.twirpx.com – international educational materials search site.
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Name of subject	Non-conventional and renewable energy sources for energy technological facilities (ECTS 10)
Subject/module code	EOUNEM21210
Science taught semester(s).	1 st and 2 nd semesters
Responsible teacher	Anarboev Mukhiddin Almanovich, PhD., associate professor.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-300. Audience Training hours – 90 Lecture training hour – 46 Practical training hour – 44 Independent education -210 hours
ECTS	10
The purpose and tasks of subject / learning outcomes	The purpose and task of this course: types and reserves of alternative energy sources, their use, production and use of heat and electricity, practical principles of their use, structure of devices working in alternative energy, principles of operation, practical principles of solar energy use, heat pumps , the structure and principle of operation of heat pumps, low-potential energy sources, heat pump devices, practical basics of wind energy, bioenergy and geothermal energy directions, use of energy from alternative energy sources, storage (accumulation), use of devices working on alternative energy sources, alternative and to have information about the joint use of traditional energy sources, the perspectives of alternative energy, the structure and principles of operation of devices for the use of alternative energy sources. The objective of the course “Non-conventional and renewable energy sources for energy technological facilities” is to prepare future specialists in the field of renewable energy, focusing on the planning, installation, and commissioning of systems powered by alternative energy sources. Students will acquire comprehensive theoretical knowledge and practical skills related to system design, energy conversion, and integration. The course also covers the structure, operation, and technical characteristics of solar, wind, geothermal, biomass, and hydrogen-based devices. It emphasizes performance analysis, environmental and economic assessment, and system optimization. Additionally, students will participate in seminars and discussions with field experts, enabling them to make responsible, well-informed engineering decisions. Learning Outcomes: 1. To acquire knowledge about the planning, installation, and commissioning of energy devices based on alternative energy sources. 2. To study the structure, operating principles, and fundamental concepts of utilizing adapted energy systems. 3. To explore the global development and implementation processes of unconventional and renewable energy technologies (URETs). 4. To understand the methods of converting natural and secondary energy sources into thermal and electrical energy. 5. To develop skills in calculating according to assessment parameters of unconventional and renewable energy sources. 6. To build competence in drawing principle circuit diagrams of renewable energy system devices. 7. To develop the ability to determine the extractable power of devices based on renewable energy technologies through calculations and to operate such systems effectively.

	8. To assess the feasibility of using renewable energy technologies in the natural conditions of the Republic of Uzbekistan.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) 1st Semester 1. The potential of renewable resources, the energy system of Uzbekistan. 2. Use of renewable resources in agriculture 3. Scales of use in some industrialized countries 4. Types of renewable sources, constructions of SES 6. Biogas energy 7. Geothermal waters 8. Concentration of sunlight 9. Autonomous solar power supply modules for low-power consumers 2nd Semester 1. Solar heat collector 2. Solar pool 3. Solar coolers 4. Environmental aspects of QTEM application 5. Social factors of QTEM application 6. Economic issues of QTEM application 7. Legal procedure for applying QTEM 8. Legal procedure for applying QTEM II. Instructions and recommendations for organizing laboratory exercises. Laboratory work is not included in the curriculum III. Practical training instructions and recommendations The instructor's preparation for a practical session begins with the study of initial documents (such as the curriculum, topic schedule, etc.) and concludes with the development of a detailed lesson plan. The instructor must have a clear understanding of the objectives and tasks of the practical session, as well as the amount of work each student is expected to perform. Recommended Practical Topics: 1st Semester 1. Characteristics of sunlight 2. Thermal method of using solar energy 3. Circulation of heat transfer in the gel system 4. Photo electric generation 5. Small hydroelectric power stations 6. Wind generators with sails, blades and rotors 7. The mode of operation of the earth's crust is the use of geothermal energy 8. Characteristics of sunlight 2nd Semester 1. Thermal, hydraulic and inertial accumulators 2. Calculation of KGES parameters 3. Calculation of MICRO HPP parameters 4. Calculation of ShEQ parameters 5. Calculation of QES parameters 6. Calculation of wind turbines IV. Independent learning and practical exercises Independent learning competency helps students to develop self-improvement skills and increase the efficiency of their professional activities. Students perform independent tasks on their mobile devices under the guidance of a teacher, either in traditional or electronic form.

	Recommended topics for practical exercises: 1st Semester 1. Challenges in the Utilization of Renewable Energy Sources 2. Desalination of Water and Air Cooling Using Solar Energy 3. Biological, Chemical, and Mechanical Methods of Energy Storage 4. Efficiency Calculation of Hydrogen-Oxygen Fuel Cells 5. Electrical Safety Requirements and Usage Procedures of Photovoltaic Power Stations 6. Inspection and Technical Maintenance of Decentralized Power Supply Systems 2nd Semester 7. Methods for Processing Biomass 8. Types of Energy Obtained from Biomass Processing 9. Global Development of Biogas Technologies and Factors Influencing Biogas Production 10. Design and Installation Processes for Biogas Systems and Small/Micro Hydropower Plants 11. Study of the Electrophysical Properties of Solar Cell Batteries
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational

materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects.

MIDTERM CONTROL

Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course.

Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject.

INDEPENDENT LEARNING

Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students.

Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control.

FINAL CONTROL

Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand,

				know, express, and narrate the essence of the subject, and have an idea about the subject.		
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.		
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.		
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.		
Course assessment criteria and procedure		Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
	Current assessment	30 points		System tasks	20 points (divided by the number of tasks)	18 points
				Student activity (in seminars, practical, laboratory classes)	10 points	
	Midterm assessment	20 points		Supervision: Written work	10 points	12 points
				System tasks	10 points (divided by the number of tasks)	
	Final assessment	50 points		Written assignment (5 questions)	50 points (10 points per question)	30 points
	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.					
Recommendation done literature	Main literature: - Qayta tiklanuvchi energiya manbalari fanidan o'quv qo'llanma N. T. Toshpo'latov, D. B. Qodirov Toshkent – 2020 20-bet. - Альтернативные источники энергии и энергосбережение : практические конструкции по использованию энергии ветра, солнца, воды, земли, биомассы / В. Германович, А. Турилин. — Санкт-Петербург : Наука и Техника, 2014. — 317 с. - Альтернативные топливно-энергетические ресурсы: экономикоуправленческие аспекты использования в условиях инновационного развития общества / В. В. Богатырева и др. — Новополюк : Полоцкий государственный университет, 2017. — 323 с. - Закон Республики Узбекистан «О рациональном использовании энергии» 1997 г.					

6. Материалы широкомастабного совместного проекта ПРООН/ГЭФ и Правительства Узбекистана «Повышение эффективности зданий социального назначения в Узбекистане» 2011 г.

7. Постановление Кабинета Министров РУз №164 «Правила проведения энергетического аудита и энергетических экспертиз потребителей ТЭР».

а. 07.08.2006 г.

8. Постановление Кабинета Министров Республики Узбекистан № 13 «О мерах по разработке концепции реформирования системы теплоснабжения и программы модернизации и развития системы теплоснабжения в республике на период 2009-2015 годы» 2009 г.

9. КМК 2.01.04-97 Строительная теплотехника. Госкомархитектстрой РУз- Ташкент:1997.

10. КМК 2.04.05-97 Отопление, вентиляция и кондиционирование. Госкомархитектстрой РУз-Ташкент: 1997.

11. КМК 2.08.04-04 Нормативы расхода энергии на отопление, вентиляцию и кондиционирование зданий и сооружений. Госкомархитектстрой РУз-

12. Ташкент:2004

13. КМК 2.01.18-00 Административные здания Госкомархитектстрой РУз- Ташкент:2000.

Additional literature:

14. КМК 2.03.10-95 Крыши и кровли. Госкомархитектстрой РУз-Ташкент: 1995

15. ШНК 2.08.02-09 Общественные здания и сооружения.

16. Госкомархитектстрой РУз-Ташкент:2009.

17. Здания и сооружения, приспособляемые под лечебные учреждения. Госкомархитектстрой РУз-Ташкент: 1997.

18. Богословский В.Н., Поз М.Я.. Теплофизика аппаратов утилизации тепла систем отопления, вентиляции и кондиционирования воздуха. М., Стройиздат, 1983.

19. 13.Энергосбережение в системах теплоснабжения, вентиляции и кондиционирования воздуха. (Справочное пособие), под ред. Богуславского

20. Л.Д., М., Стройиздат, 1990.

21. Mirziyoev SH.M. Tankidiy taxlil, kat'iy tartib-intizom va shaxsiy javobgarlik - xar bir raxbar faoliyatining kundalik koidasi bulishi kerak. Uzbekiston Respublikasi Vazirlar Maxkamasining 2016 yil yakunlari va 2017 yil istikbollariga bagishlangan majpisidagi Uzbekiston Respublikasi Prezidentining nutqi. // "Xalq so'zi" gazetasi.

22. 2017 y.. 16 yanvar, №11.

23. O'zbekiston Respublikasi Konstitutsiyasi. - T.: Uzbekiston, 2017. - 46 b.

24. Mirziyoev SH.M. Buyuk kelajagimizni mard va olijanob xalkimiz bilan birga kuramiz. - T.: "Uzbekiston" NMIU, 2017. - 488 b.

25. O'zbekiston Respublikasini yanada rivojlantirish buyicha Xarakatlar strategiyasi tugrisida. - T.:2017 yil 7 fevral, PF-4947-sonli Farmoni.

26. «Правила проведения энергетического аудита и энергетических экспертиз потребителей ТЭР». Постановление Кабинета Министров РУз №1640708.2006 г.

27. Правила пользования тепловой энергией. Ташкент: Узгосэнергонадзор, 2005.

28. Правила пользования электрической энергией.

	Ташкент: 29. Узгосэнергонадзор, 2005. 30. 21.Методические указания по определению расходов топлива, электроэнергии и воды на выработку тепла отопительными котельными коммунальных теплоэнергетических предприятий. Москва, Академия коммунального хозяйства им. Памфилова, 1994 г. 31. 22.Энергоаудит промышленных и коммунальных предприятий. Учебное пособие. Б.П.Варнавский, А.И.Колесников, М.Н.Федоров. Издательство АСЭМ, М., 1999 Internet sites: 1. www.gov.uz –Government portal of the Republic of Uzbekistan. 2. www.catback.ru – international scientific articles and educational materials website. 3. www.google.ru – international educational materials search website. 4. www.ziynet.uz – national educational materials search website. 5. www.lex.uz – national database of legal documents and information. 6. www.catback.ru – scientific articles and educational materials
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Name of subject	Energy audit equipment and measurement methods (ECTS 10)
Subject/module code	EAJO‘U21210
Science taught semester (s).	1 st and 2 nd semesters
Responsible teacher	Nazarov Furkat Daminovich (PhD), senior teacher.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-300 Audience Training hours – 90 Lecture training hour – 46 Practical training hour – 44 Independent education -210 hours
ECTS	10
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is to the main goal of “Energy audit equipment and measurement methods” is to teach students the basic essence of energy conservation policy, to use energy wisely, to normalize consumption in energy forms, to manage energy savings, to use secondary energy resources, to implement energy saving measures in practice and to generate the skill of using energy. The task of the subject is to are the types and reserves of secondary energy sources generated in energy, energy-technological devices and technologies in industrial enterprises, analysis of the characteristics and potentials of the exit gases of heat technology devices, drawing up the energy and exergy balance of heat technology devices, methods of calculating efficiency, waste consists in mastering the principles of heat utilization. Learning outcomes: 1. The ability of enterprises to get an idea in a systematic taxable framework in solving organizational and technical issues in the management of the enrtgetic economy. 2. The importance of how to form an energy passport of enterprises. 3. Development of energy efficient slurry proposals that meet energy efficiency requirements. 4. To know and be able to use the technical parameters of Energoaudit measuring instruments. 5. The main performance indicators and options for their improvement in different types of energy devices. 6. Energetic equipment improve work productivity. 7. Study of Energoaudit measuring instruments. 8. Be able to know and use the existing basic legal and regulatory documents in the field
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topic 1: Goals and objectives of instrumental energy audit in enterprises. Topic 2: Methodology and basic principles of energy audit. Topic 3: Types and methods of measurements in instrumental energy audit. Topic 4: Normalizing electricity consumption in enterprises. Topic 5: Current energy consumption status.Statistical reports. Topic 6: Direct measurement of energy and energy carrier consumption. Topic 7: Partial and indirect measurement of energy and energy carrier consumption parameters. Topic 8. Energetik balans va uning turlari. Topic 9: Methods and equipment for conducting energy audits. Topic 10: Boiler-utilizers of steel melting and rolling production. Topic 11: Calculation of heat energy consumption by consumers.

Topic 12: General terms of modern measuring instruments necessary for conducting energy research and energy auditing.

Topic 13: Modern measuring instruments for determining power, electricity, quality and phase difference.

Topic 14: Modern measuring instruments for energy audits in heating systems.

Topic 15: Modern measuring instruments for energy audits of pumping units

Topic 16: Modern measuring instruments for energy tracking in lighting devices.

Topic 17: Modern measurement instruments for energy audits in compressed air systems.

Topic 18: Modern measuring instruments for energy audits of air exchange (ventilation) systems of enterprises and organizations.

II. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Types and procedure of energy research
2. Energy audit of technical systems of enterprises
3. Calculation of the total heat content of waste gases.
4. Determination of fuel savings when using waste gas heat.
5. Calculation of the combustion process in use of exhaust gases containing combustible gases
6. Energy saving when low-temperature heat carrier is disposed.
7. Energy saving in the use of a steam-gas device.
8. Calculation of energy saving potentials in hot water, steam production and distribution systems.
9. Assessment of energy consumption by gas heating devices.
10. Energy saving in the use of heat pumps.
11. Calculation of technical and economic efficiency of energy-saving measures.
12. Power quantity and quality analyzer device
13. Parameters of the device temperature measurement equipment

III. Independent learning and independent work.

Independent learning competence serves to support students' independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form.

Recommended topics for independent study:

1. General rules and legal framework
2. Energy audits and organization of energy audit
3. Rights and responsibility during energy audit
4. Requirements of consumers of fuel and energy resources
5. General concepts of the necessary modern measuring instruments for energy inspection and energy audit
6. Modern measuring devices for determining power, electricity, quality and phase voltage difference.

	7.Modern measuring devices for energy audits in heat supply systems. 8.Modern measuring instruments for energy audits in pumping units 9.Modern measuring instruments for energy audits in lighting devices 10.Modern measuring instruments for energy audits in compressed air systems 11.Modern measuring instruments for energy audit in air exchange (ventilation) systems of enterprises and organizations 12.First level energy survey 13.Energy survey of the second level (in-depth energy survey) 14.Types and order of energy surveys 15.Development of a program for energy audits and energy audits and the procedure for registration. 16.Energy audit of power supply systems: energy losses in power grids; energy losses in transformers; energy losses in electric motors 17.Energy audit in pumping unit systems 18.Energy audit in heat supply systems 19.Energy audit in lighting systems 20.Energy audit in air exchange (ventilation) systems of enterprises 21.Energy audit in compressed air systems of enterprises and organizations 22.Electricity balance 23.Methods of economic valuation in water consumption systems 24.The procedure for the development and economic assessment of energy saving 25.The procedure for preparing the final energy audit report
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the

specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc.

Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects.

MIDTERM CONTROL

Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course.

Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject.

INDEPENDENT LEARNING

Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students.

Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control.

FINAL CONTROL

Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor.

Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.

Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and

				decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.	
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.	
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.	
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.	
Course assessment criteria and procedure	Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
	Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
			Student activity (in seminars, practical, laboratory classes)	10 points	
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points
			System tasks	10 points (divided by the number of tasks)	
	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points
	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.				
Recommended Literature	Main literature:				
	1. Energiya nazorati va yoqilg'i-energetika resurslari iste'molchilarining ekspertizalarini o'tkazish qoidalari. O'zbekiston Respublikasi Vazirlar Mahkamasining 2006 yil 7 avgustdagi 164-sonli qarori.				
	2. Allaev K.R., Xoshimov F.A.. Энергосбережения на промышленных предприятиях. Tashkent: Izd-vo «Fan» AN RUz, 2011. - 208s.				
	3. Безлепкии В.П. Парогазове и паротурбинне установки электростансий. СПб.: Изд-во СПбГТУ, 1997. 295 с.				
	4. Цанеев С.В. Газотурбинне и парогазове установки тепловх электростансий: учебное пособие для вузов/				
	5. С.В. Санеев, В.Д. Буров, А.Н. Ремезов; под ред. С.И. Цанаева.				

М.: Изд-во МЕИ, 2002. 584 с.

6. Фаворский О.Н. Технологические схем и показатели экономичности ПГУ с впрском пара в газовой тракт/О.Н. Фаворский, С.В. Санеев, В.Д. Буров, Д.В. Карташов// Теплоэнергетика. 2005. №4. С. 28 - 34.

7. Вайне с. Турнер, Стеве Дотй. Энергй манагемент Ҳандбоок. ИСБН: 0-88173-542-6 (принт) -0-88173-543-4 (электронис).2006. 909

8. А.П. Воинов, Л.И. Купермен, С.П. Сушон. “Паровие котли на отходящих газах, Киев 1983.

18. Журнал «Проблемы энерго- и ресурсосбережения». - Ташкент: Издательство ТашГТУ. №№ И -4, 2003 г. и последующие выпуски.

9. Правила ползования тепловой энергией. Ташкент: Узгосэнергонадзор, 2005.

10. Shaislamov A.SH., Matchanov E.K., Energetika va texnologiyalarda issiqlikdan foydalanish., Ma’ruza matnlari., 2000.

Additional literature:

1. Allaev K.R., Xoshimov F.A.. Энергосбережения на промышленных предприятиях. Tashkent: Izd-vo «Fan» AN RUz, 2011. - 208s.

2. Безлепки В.П. Парогазове и паротурбинне установки электростансий. СПб.: Изд-во СПбГТУ, 1997. 295 с.

3. Цанеев С.В. Газотурбинне и парогазове установки тепловх электростансий: учебное пособие для вузов/

4. С.В. Санеев, В.Д. Буров, А.Н. Ремезов; под ред. С.И. Цанаева. М.: Изд-во МЕИ, 2002. 584 с.

5. Фаворский О.Н. Технологические схем и показатели экономичности ПГУ с впрском пара в газовой тракт/О.Н. Фаворский, С.В. Санеев, В.Д. Буров, Д.В. Карташов// Теплоэнергетика. 2005. №4. С. 28 - 34.

6. Рациональное использование газа в энергетических установках : справочное руководство/ Р.Б. Ахмедов [и др.]. ЖЛ: Недра, 1990. 423 с.

7. А.П. Воинов. Л.И. Купермен, С.П. Сушон. Парове котл на отходящих газах. Киев. Всшая школа. 1983.

Internet resources:

33. www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan.

34. www.ziyounet.uz – national educational materials search site.

35. www.gov.uz – Government portal of the Republic of Uzbekistan.

36. www.google.com – international educational materials search site.

37. www.energystrategy.ru – “Energy Policy and Strategy” information portal

38. www.twirpx.com – international educational materials search site.

Name of subject	Energy audit of buildings and communal facilities (ECTS 4)
Subject/module code	BKXEA2204
Science taught semester (s).	2 nd semester
Responsible teacher	Anarboev Mukhiddin Almanovich, PhD., associate professor.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-120 Audience Training hours - 36. Lecture training hour – 18 Practical training hour – 18 Independent education -84 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of this course The role of the electric power industry in the rapid development of the economy is incomparable. Due to the stable operation of the energy system of Uzbekistan, the national economy is provided with uninterrupted and high-quality electric energy. This process, in turn, increases the demand for the training of highly qualified personnel. This program reflects the goals, objectives, and content of the subject "Energy Audit of Buildings and Utilities". In-depth study of the subject of the introduction to the direction plays an important role in solving the problems of the harmful effects of energy on the environment. Students will study the structure and operating principles of devices powered by alternative sources, such as solar energy systems, heat pumps, low-potential energy sources, wind turbines, biogas plants, and geothermal units. The course emphasizes the practical applications of renewable energy systems, focusing on system design, energy accumulation and storage, hybrid operation of conventional and non-conventional sources, and the future prospects of the renewable energy sector. By completing this course, students will be able to develop and evaluate engineering solutions for the integration of renewable energy systems, optimize their performance, and assess their technical and economic viability for use in Uzbekistan's energy infrastructure. They will also gain awareness of ecological implications and the global shift toward sustainable energy development. The objective of the course “<i>Energy audit of buildings and communal facilities</i>” The goal of studying the subject is to develop skills and competencies in students in the classification and structural structure of the energy sector, the processes of generating electricity, and the effective operation of electrical devices under specific operating conditions. Learning Outcomes: 1. To acquire knowledge about the planning, installation, and commissioning of energy devices based on alternative energy sources. 2. To study the structure, operating principles, and fundamental concepts of utilizing adapted energy systems. 3. To explore the global development and implementation processes of unconventional and renewable energy technologies (URETs). 4. To understand the methods of converting natural and secondary energy sources into thermal and electrical energy. 5. To develop skills in calculating according to assessment

	parameters of unconventional and renewable energy sources. - To build competence in drawing principle circuit diagrams of renewable energy system devices. - To develop the ability to determine the extractable power of devices based on renewable energy technologies through calculations and to operate such systems effectively. - To assess the feasibility of using renewable energy technologies in the natural conditions of the Republic of Uzbekistan
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topics: - Introduction. Basic principles of energy audit. - General methodology of energy audit in residential and household buildings. - Legal and regulatory framework of energy audit. - Rules for conducting energy audit - Types and tasks of energy audit in residential and household buildings. Main stages of energy audit and their composition. - Methodology of energy audit of residential and household buildings. - Fundamentals of energy audit of heat consumption in residential and household buildings. - Typical algorithm of energy audit in a heating boiler room. - Analysis of operating modes of the heating system. - Energy audit of heat supply systems. - Calculation of the resistance of building structures to thermal conductivity. - Requirements for thermal conductivity resistance depending on the types of buildings in the KMC - Thermal insulation and densification of building structures with thermal insulation. - Analysis of the operating modes of boiler plants. - Analysis of the completeness of the combustion process in boiler plants. - Cleaning and prevention of contamination in heat exchange devices and pipes. - Energy passport of the building and its purpose. Fundamentals and tasks of energy monitoring II. Instructions and recommendations for organizing laboratory exercises. Laboratory work is not included in the curriculum III. Practical training instructions and recommendations The instructor's preparation for a practical session begins with the study of initial documents (such as the curriculum, topic schedule, etc.) and concludes with the development of a detailed lesson plan. The instructor must have a clear understanding of the objectives and tasks of the practical session, as well as the amount of work each student is expected to perform. Recommended Practical Topics: - Calculation of the maximum hourly heating load - Calculation of the maximum hourly ventilation load - Calculation of the maximum hourly hot water supply load - Energy fuel - Combustion of products in the boiler room - Calculation of the volume of combustion products in the boiler room - Calculation of convective surfaces of the boiler

	8. Calculation of heat transfer of heating devices 9. Calculation of air exchange in the building 10. Calculation of air exchange in residential and household buildings 11. Calculation of heat losses in hot water and heating systems 12. Calculation of heat losses in centralized heating points 13. Calculation of losses in power supply systems 14. Calculation of main losses of buildings 15. Drawing up an energy passport of the building. IV. Independent learning and practical exercises The purpose of independent work is to consolidate and deepen theoretical and practical knowledge obtained in lectures, experiments and practical exercises in the subject, taking into account scientific and technical innovations. Independent work is formalized in written form (stand, software, demonstration device, abstract, graphical calculation work, etc.), taking into account the requirements of relevant regulatory documents. Independent work provides for the acquisition of more in-depth knowledge of the subject under study, using various information sources, including literature, journal articles, computer resources (Internet), etc. Recommended topics for practical exercises: 1. Extensive study of legal and regulatory documents related to energy audits of households and buildings 2. Comprehensive study of the rules for conducting energy audits and energy expertise 3. Energy saving potential and energy saving measures in household buildings. 4. Method of conducting a boiler regime (compilation of a regime card) 5. Application of new energy-saving technologies in household buildings (Heat pumps, "Fisonic" technology, use of new heat exchangers, etc.) 7. Energy saving potential and energy saving measures in household buildings. 2nd semester 8. Modern automated heat points 9. Modern lighting equipment and reactive power compensators 10. Energy management systems and main stages of buildings. 11. Methods of statistical processing of databases 12. Energy management systems for buildings and their main stages. 13. Standards for certification of building energy efficiency. 14. Monitoring of building energy consumption.
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal

	of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject. INDEPENDENT LEARNING Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students. Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher. In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control. FINAL CONTROL Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform.

	Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor. Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.				
Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria	
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.	
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.	
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.	
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.	
Course assessment criteria and procedure	Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score
	Current assessment	30 points	System tasks	20 points (divided by the number of tasks)	18 points
			Student activity (in seminars, practical, laboratory classes)	10 points	
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points
			System tasks	10 points (divided by the number of tasks)	

	<table><tr><td>Final assessment</td><td>50 points</td><td>Written assignment (5 questions)</td><td>50 points (10 points per question)</td><td>30 points</td></tr><tr><td colspan="5">* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.</td></tr></table>	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.				
Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points							
* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.											
Recommendation done literature	Main literature: 1. Закон Республики Узбекистан «О рациональном использовании энергии» 1997 г. 2. Материалы широкомастабного совместного проекта ПРООН/ГЭФ и Правительства Узбекистана «Повышение эффективности зданий социального назначения в Узбекистане» 2011 г. 3. Постановление Кабинета Министров РУз №164 «Правила проведения энергетического аудита и энергетических экспертиз потребителей ТЭР». 07.08.2006 г. 4. Постановление Кабинета Министров Республики Узбекистан № 13 «О мерах по разработке концепции реформирования системы теплоснабжения и программы модернизации и развития системы теплоснабжения в республике на период 2009-2015 годы» 2009 г. 5. КМК 2.01.04-97 Строительная теплотехника. Госкомархитектстрой РУз- Ташкент:1997. 6. КМК 2.04.05-97 Отопление, вентиляция и кондиционирование. Госкомархитектстрой РУз-Ташкент: 1997. 7. КМК 2.08.04-04 Нормативы расхода энергии на отопление, вентиляцию и кондиционирование зданий и сооружений. Госкомархитектстрой РУз- Ташкент:2004. 8. КМК 2.01.18-00 Административные здания Госкомархитектстрой РУз- Ташкент:2000. Additional literature: 9. КМК 2.03.10-95 Крыши и кровли. Госкомархитектстрой РУз-Ташкент: 1995 10. ШНК 2.08.02-09 Общественные здания и сооружения. Госкомархитектстрой РУз-Ташкент:2009. 11. Здания и сооружения, приспособляемые под лечебные учреждения. Госкомархитектстрой РУз-Ташкент: 1997. 12. Богословский В.Н., Поз М.Я.. Теплофизика аппаратов утилизации тепла систем отопления, вентиляции и кондиционирования воздуха. М., Стройиздат, 1983. 13. Энергосбережение в системах теплоснабжения, вентиляции и кондиционирования воздуха. (Справочное пособие), под ред. Богуславского Л.Д., М., Стройиздат, 1990. 14. Mirziyoyev SH.M. Tankidiy taxlil, kat'iy tartib-intizom va shaxsiy javobgarlik - xar bir raxbar faoliyatining kundalik koidasi bulishi kerak. Uzbekiston Respublikasi Vazirlar Maxkamasining 2016 yil yakunlari va 2017 yil istikbollariga bagishlangan majpisidagi Uzbekiston Respublikasi Prezidentining nutqi. // “Xalq so’zi” gazetasi. 15. 2017 y.. 16 yanvar, №11. 16. O’zbekiston Respublikasi Konstitutsiyasi. - T.: Uzbekiston, 2017. - 46 b. 17. Mirziyoyev SH.M. Buyuk kelajagimizni mard va olijanob xalkimiz bilan birga kuramiz. - T.: “Uzbekiston” NMIU, 2017. - 488 b. 18. O’zbekiston Respublkasini yanada rivojlantirish buyicha Harakatlar strategiyasi tugrisida. - T.:2017 yil 7 fevral, PF-4947-sonli Farmoni. 19. «Правила проведения энергетического аудита и энергетических экспертиз потребителей ТЭР». Постановление										

Кабинета Министров РУз №1640708.2006 г.

20. Правила пользования тепловой энергией. Ташкент: Узгосэнергонадзор, 2005.

21. Правила пользования электрической энергией. Ташкент: Узгосэнергонадзор, 2005.

22. Методические указания по определению расходов топлива, электроэнергии и воды на выработку тепла отопительными котельными коммунальных теплоэнергетических предприятий. Москва, Академия коммунального хозяйства им. Памфилова, 1994 г.

23. Энергоаудит промышленных и коммунальных предприятий. Учебное пособие. Б.П.Варнавский, А.И.Колесников, М.Н.Федоров. Издательство АСЭМ, М., 1999

Internet sites:

1. www.gov.uz –Government portal of the Republic of Uzbekistan.
2. www.catback.ru – international scientific articles and educational materials website.
3. www.google.ru – international educational materials search website.
4. www.ziyonet.uz – national educational materials search website.
5. www.lex.uz – national database of legal documents and information.
6. www.catback.ru – scientific articles and educational materials.

Name of subject	Rational use of energy and regulation of electricity consumption (ECTS 4)
Subject/module code	ERFESM2204
Science taught semester (s).	1 st and 2 nd semesters
Responsible teacher	Abdullaev Elnur Akhmatovich, PhD., associate professor.
Education language	Uzbek
Connection to the curriculum	Elective
Training hours (this including independent education)	Total hours-120 Audience Training hours – 36 Lecture training hour – 18 Practical training hour – 18 Independent education -84 hours
ECTS	4
The purpose and tasks of subject / learning outcomes	The purpose of teaching the subject is The purpose of teaching science is to teach to have knowledge in the range of technical means that serve to automate energy efficient devices; to teach to know the structural structure and operating bases of energy efficient electrical and electrical mechanically controlled energy switches applied to automate energy efficient devices; to teach energy efficient technical means that provide the basics of optimal control of energy efficient; energy consists in training to have rational use skills and is to provide a level of knowledge that is appropriate for the orientation profile. The objective of the course “Rational use of energy and regulation of electricity consumption” The task of the subject is the structure of energy-efficient electrical circuits of industrial mechanisms, the principles and classification of technical tools in the creation of automated systems of operating devices, the analysis of various practical issues of automation, independent thinking, decision-making, gaining knowledge on energy optimization and technical service. is to form the formation of practical skills on presentation. Learning Outcomes: 1. Development of measures to increase and popularize energy efficiency; 2. Identification and elimination of power loss in the electricity supply system; 3. Role of Rational use of energy and regulation of electricity consumption in society and socio-economic importance; 4. Study of Rational use of energy and regulation of electricity consumption using modern computer programs; 5. Studying the technical and economic indicators of Rational use of energy and regulation of electricity consumption, their place in ecology and the principles of use; 6. Ability to perform Rational use of energy and regulation of electricity consumption; 7. Acquaintance with the mains of Rational use of energy and regulation of electricity consumption; 8. To know and be able to use the existing main legal and regulatory documents in the field.
Course content (topics)	I. Main Theoretical Part (Lecture Sessions) Topics: 1. Reducing the idle mode of devices and rational use of energy in power equipment. 2. Rational exploitation of electrical networks. 3. Energy balance for aggregates.

	4. Use of energy devices and their efficiency indicators. 5. Device efficiency and system indicators of energy consumption. 6. Electricity balance of industrial enterprises. 7. Calculation of comparative norms. 8. Building envelope and passive solar components. 9. The technology of windows. Mirroring coefficient. Solar energy transfer coefficient. II. Instructions and recommendations for organizing laboratory exercises. Laboratory work is not included in the curriculum III. Practical training instructions and recommendations The instructor's preparation for a practical session begins with the study of initial documents (such as the curriculum, topic schedule, etc.) and concludes with the development of a detailed lesson plan. The instructor must have a clear understanding of the objectives and tasks of the practical session, as well as the amount of work each student is expected to perform. Methodological guidelines serve as the primary instructional document for instructors in preparing and conducting practical sessions. The purpose of the practical session is to facilitate the comprehension of theoretical material, the acquisition of practical skills, the ability to consciously apply knowledge in academic and professional activities, and the development of critical thinking and confidence in forming personal viewpoints. <i>Recommended Practical Topics:</i> 1. Rational use of electricity in the water supply, ventilation, heating system. 2. Correct choice of electric motor power. 3. Rational use of electricity in power transformers. 4. Energy characteristics of electrical equipment. 5. Rational exploitation of electrical networks. 6. Calculation of comparative norms. 7. Reducing the peak power of the energy system. 8. Advantage of parallel operation of two transformers. IIV. Independent learning and practical exercises Independent learning competency helps students to develop self-improvement skills and increase the efficiency of their professional activities. Students perform independent tasks on their mobile devices under the guidance of a teacher, either in traditional or electronic form. <i>Recommended topics for practical exercises:</i> 1. Energy efficiency reserves and energy efficiency measures in various industries. 2. World experience of using new energy-efficient technologies in industry. 3. Saving electricity using reactive power compensation. 4. Energy and power losses in the power supply system. 5. Impact of frequency changes on the power grid and consumers. 6. Regulation of consumption of electricity and thermal energy in industrial enterprises. 7. Application of new energy-efficient technologies in industrial power supply systems. 8. Use and efficiency indicators of energy devices. 9. System indicators of device efficiency and energy consumption. 10. Electricity balance of industrial enterprises. 11. Reducing the peak power of the energy system. 12. Advantage of parallel operation of two transformers.
Exam form	Written
Teaching/learning and examination requirements	Complete mastery of theoretical and methodological concepts and practical knowledge of the discipline, the ability to correctly reflect the

	results of analysis, independently reason about the processes being studied and carry out tasks in the current, intermediate forms of control and independent work, pass written work on the final control. When drawing up final exam questions, deviations from the content of the discipline program are not allowed. The bank of final exam questions for each discipline is discussed at the meeting and approved by the head of the department. No later than 1 week before the start of the final control, tickets signed by the head of the department, enclosed in an envelope, are sealed by the Dean's office and opened 5 minutes before the start of the exam in the presence of students. Final exam duration is 80 minutes. Answers to final exam questions are recorded in copybooks with the seal of the Dean's office. After completion of the final work, the work is immediately encrypted by a representative of the Dean's office, and the copybooks are handed over to the commission for verification. From the moment of completion of the final exam, a period of 72 hours is allotted for checking and posting the results on the electronic platform. The teacher who taught the students in this discipline is not involved in the process of conducting the exam and checking the students' answers. Student(s) who are dissatisfied with the final exam results may submit a written or oral appeal within 24 hours of the publication of the final exam results. Complaints submitted after 24 hours from the publication of the final exam results will not be accepted.
Scope of assessment criteria and procedure	CURRENT CONTROL Purpose: Determining and assessing the student's level of knowledge, practical skills, and competencies on course topics. Instructions: The student's activity in daily classes is assessed through the student's mastery of course topics, as well as constructively interpreting and analyzing the educational material, developing module-specific skills, acquiring practical skills (in terms of quality and the specified number) and competencies, solving problem situations aimed at applying professional practical skills, working in a team, preparing presentations, etc. Current control form: Activity in lessons Preparing educational materials Working with sources within the subject Using educational technologies Working in a team Preparing presentations Working with projects. MIDTERM CONTROL Purpose: Assessing the student's knowledge and practical skills and level of mastery of lecture material after completing the relevant section of the course. Form and procedure of intermediate control: Midterm examination is held during the semester during the training sessions after the completion of the relevant module of the curriculum of the subject. Midterm examination is held once in written form within the framework of this subject. Midterm examination questions cover all topics of the subject. INDEPENDENT LEARNING Purpose: Independent learning is aimed at fully covering the content of this course, expanding the theoretical knowledge acquired, and establishing independent learning activities for students. Form and procedure of independent education: independent work assignments are completed in the form of an educational project, presentation, case study, problem solving, information search, digest, colloquium, essay, article, abstract, etc. Completed assignments for independent study are placed in the electronic system and checked based on the anti-plagiarism program and evaluated by the subject teacher.

	In this case, the uniqueness of the completed assignment should not be less than 60%, otherwise the assignment will not be accepted for assessment. The number of independent work assignments, depending on the nature of the subject, should not be less than 3 for one subject (module). Independent work assignments account for 60% of the points allocated for current and intermediate control. FINAL CONTROL Purpose: The final examination is held at the end of the semester to determine the level of mastery of the student's theoretical knowledge and practical skills in the relevant subject. The final examination is held at a specified time according to the examination schedule created by the Registrar's Office on the electronic platform. Requirements: The student must have passed the current control, intermediate control and independent learning assignments by the deadline for the final control type in the relevant subject. A student who has not passed the current control, intermediate control and independent learning assignments, as well as who has received a score in the range of "0-29.9" for these assignments and control types, is not included in the final control type. Also, a student who has missed 25 percent or more of the classroom hours allocated to a subject without a reason is excluded from this subject and is not included in the final control type and is considered not to have mastered the relevant credits in this subject. A student who has not passed or was not included in the final control type and has received a score in the range of "0-29.9" for this type of control is considered to be an academic debtor. Final control form: The final examination in this subject will be conducted in written form. If the final examination is conducted in written form, the requirements for assessment must also be reflected.					
Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria		
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.		
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.		
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.		
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.		
Course assessment criteria and procedure	Assessment type	Total points allocated	Control (task) form	Distribution of points	Qualifying score	
	Current assessment	30 points	System tasks	20 points (divided by the number	18 points	

				of tasks)	
			Student activity (in seminars, practical, laboratory classes)	10 points	
	Midterm assessment	20 points	Supervision: Written work	10 points	12 points
			System tasks	10 points (divided by the number of tasks)	
	Final assessment	50 points	Written assignment (5 questions)	50 points (10 points per question)	30 points
* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.					
Recommended Literature	Main literature: 1. Law of the Republic of Uzbekistan “On electric energy”. Received June 24, 2009. 2. Taslimov A.D., Karimov R.Ch. Energiyadan ratsional foydalanish va elektr energiya sarfini meyorlash. O‘quv qo‘llanma.– Toshkent– 2020.– 101 s 3. Taslimov A.D. Energiyadan ratsional foydalanish va elektr energiya sarfini meyorlash. Amaliy mashg‘ulotlar uchun uslubiy ko‘rsatma. – Toshkent – 2020. 4. Raxmonov I.U. “Elektr ta‘minoti asoslari”. Darslik. Toshkent: 2019, 226 b. 5. Rasulov A.N., Usmonov E.G., Meliqo‘ziyev M.V. Elektr energiyasining sifat ko‘rsatkichlari. O‘quv qo‘llanma. – Toshkent.: – 2020. - 164b. 6. A.N.Rasulov, A.D.Taslimov, I.U.Raxmonov, M.V.Meliqo‘ziyev “Sanoat korxonalarining elektr ta‘minoti”. Darslik. Toshkent: 2020, 202b. 7. Laura M. Platchkov and Michael G. Pollitt. The Economics of Energy (and Electricity) Demand. University of Cambridge. - April 2011. Additional literature: 8. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b. 9. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati‘yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017– 592 b 10. Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 “On the Development Strategy of New Uzbekistan for 2022-2026”. 11. Decree of the President of the Republic of Uzbekistan No. PF-220 dated 09.09.2022 “On additional measures for the introduction of energy-saving technologies and the development of small-capacity renewable energy sources”. 12. Taslimov A.D. Energiyadan ratsional foydalanish va elektr energiyasi sarfini normalash fanidan kurs loyihasini bajarish uchun uslubiy qo‘llanma. Toshkent davlat texnika universiteti – 2020. 13. Xoshimov F.A., Taslimov A.D. Energiya tejamkorligi asoslari. O‘quv qo‘llanma. – T.: “Voriz”, 2014 – 192 bet. 14. Аллаев К.Р., Хошимов Ф.А. Энергосбережение в промышленных предприятиях, Монография. – Т.:Fan. 2012.				

	15. Saidxodjayev A.G. Shaharlarni elektr ta'minoti asoslari. Darslik Toshkent, TDTU-2020, 176 b. Internet sites: 16. www.gov.uz –Government portal of the Republic of Uzbekistan. 17. www.catback.ru – international scientific articles and educational materials website. 18. www.google.ru – international educational materials search website. 19. www.ziynet.uz – national educational materials search website. 20. www.lex.uz – national database of legal documents and information. 21. www.catback.ru – scientific articles and educational materials.
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Name of subject	Scientific research and academic-pedagogical work, preparation of a master's dissertation (ECTS 38)														
Subject/module code	ITIMDT3123438														
Science taught semester (s).	1 st / 2 nd / 3 rd / 4 th semesters														
Responsible teachers	Abdullaev Elnur Akhmatovich, Doctor of Philosophy (PhD) in Technical Sciences, Associate Professor Anarboev Mukhiddin Almanovich, Doctor of Philosophy (PhD) in Technical Sciences, Associate Professor Nazarov Furkat Daminovich, Doctor of Philosophy (PhD) in Technical Sciences, senior teacher. Yuldashe Urishbay, Doctor of Physics and Mathematics, professor Parsoxonov Abdulkobi Gafurovich, Candidate of Physical and Mathematical Sciences, Associate Professor.														
Education language	Uzbek														
Connection to the curriculum	Compulsory														
Training hours (this including independent education)	Total hours-180 <table><tr><td>Semester</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Total workload</td><td>180</td><td>90</td><td>270</td><td>600</td></tr></table>					Semester	1	2	3	4	Total workload	180	90	270	600
Semester	1	2	3	4											
Total workload	180	90	270	600											
ECTS	38														
The purpose and tasks of discipline / learning outcomes	The purpose of the discipline is to prepare the master's student for independent research and pedagogical work, the main result of which is writing a master's thesis, conducting experiments, organizing pedagogical practice, and successfully defending the dissertation. Learning outcomes - the ability to apply methods of scientific knowledge in independent research activities, generate and implement innovative ideas; - own the methodology of scientific knowledge, be able to analyze and evaluate the content and level of philosophical and methodological problems when solving problems of research and innovation activities; - designing and conducting comprehensive, systematic scientific research based on knowledge and skills in the field of energy, including innovative studies; - have the skills to use modern information technologies to solve research and innovation problems; - conducting scientific research activities in the field of energy using modern research methods and information and communication technologies; - adapt the results of modern energy and technical research to solve problems in the electric power system.														
Course content (topics)	1. The relevance and necessity of the scientific research topic. 2. Selecting and Approving a Master's Thesis Topic. 3. The purpose and objectives of the master's dissertation. 4. The procedure and rules for structuring the dissertation contents. 5. The procedure and methods for conducting a literature review within the scope of the dissertation topic. 6. Conducting experiments within the scope of the dissertation work. 7. Conducting Experimental Research on the Scientific Topic, Summarizing and Analyzing the Results. 8. Preparing and Publishing Scientific Theses and Articles Based on the Research Conducted and the Results Obtained for the Master's Dissertation.														

	9. Applying the Research Conducted and Its Results from the Master's Dissertation to Practical Use. 10. Studying Existing Problems in Practice within the Framework of the Master's Dissertation and Developing Recommendations for Their Scientific Solutions. 11. Participating in Various Conferences and Scientific Seminars and Delivering Presentations Based on the Conducted Research Work.			
Exam form	The report will be submitted in the form of a presentation			
Teaching/learning and examination requirements	No more than 3 days are allotted for drawing up the final report, during which masters put their individual plan in order, prepare written reports, and prepare presentations. Each masters submits the following materials: - Report text; - Individual plan and characteristics from the supervisor; - Presentations of master's students-interns in electronic form. The credit for research activities (practice) is accepted by the commission in accordance with the approved order, in the presence of all masters and their supervisors. During the certification, the competencies of master's students-interns, which they mastered in the process of carrying out research activities (practice), are assessed.			
Criteria for assessing student knowledge	5 grade	100 points		Assessment criteria
	5	90-100	Excellent	When a student is considered to be able to make independent conclusions and decisions, think creatively, observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and have an idea about the subject.
	4	70-89,9	Good	When the student is considered to be able to observe independently, apply the knowledge he has gained in practice, understand, know, express, and narrate the essence of the subject, and has an idea about the subject.
	3	60-69,9	Satisfactory	When the student is found to be able to apply the knowledge he has gained in practice, understands, knows, can express, and narrate the essence of the subject, and has an idea about the subject.
	2	0-59,9	Unsatisfactory	When it is determined that the student has not mastered the science program, does not understand the essence of the subject, and does not have an idea about the science.
Criteria for evaluating students' scientific research, pedagogical work, and the tasks completed during the preparation of their master's thesis	S/n	Name of events and tasks	Allocated points	Report form
	1	The relevance and necessity of the scientific research topic.	0-5	A report in the form of a presentation will be prepared on the relevance and necessity of the research topic.
	2	Selecting and Approving a Master's Thesis Topic.	0-5	A report in the form of a presentation will be prepared on the selection and approval of the

			master's thesis topic
3	The purpose and objectives of the master's dissertation.	0-5	A report in the form of a presentation will be prepared on the objectives and tasks of the master's thesis
4	The procedure and rules for structuring the dissertation contents.	0-5	A report in the form of a presentation will be prepared on the structure and formatting rules of the thesis content
5	The procedure and methods for conducting a literature review within the scope of the dissertation topic	0-10	A report in the form of a presentation will be prepared on the procedure and methods of analyzing literature related to the thesis topic
6	Conducting experiments within the scope of the dissertation work.	0-15	A report in the form of a presentation will be prepared on conducting experiments within the framework of the thesis work
7	Conducting Experimental Research on the Scientific Topic, Summarizing and Analyzing the Results.	0-15	A report in the form of a presentation will be prepared on conducting experimental research on the scientific topic, summarizing and analyzing the results
8	Preparing and Publishing Scientific Theses and Articles Based on the Research Conducted and the Results Obtained for the Master's Dissertation.	0-10	A report in the form of a presentation will be prepared on preparing and publishing scientific theses and articles based on the conducted research for the master's thesis.
9	Applying the Research Conducted and Its Results from the Master's Dissertation to Practical Use.	0-10	A report in the form of a presentation will be prepared on the practical application of the research and its results conducted within the framework of the master's thesis
10	Studying Existing Problems in Practice within the Framework of the Master's Dissertation and Developing Recommendations for Their Scientific	0-10	A report in the form of a presentation will be prepared on studying existing practical problems within the thesis framework and developing scientific recommendations for their solution

		Solutions.		
	11	Participating in Various Conferences and Scientific Seminars and Delivering Presentations Based on the Conducted Research Work.	0-10	A report in the form of a presentation will be prepared on participating in various conferences and scientific seminars and delivering presentations based on the conducted research
	* Note: 60% of the points allocated for current and intermediate control are allocated to independent work assignments. Independent work assignments are evaluated as system assignments through the electronic platform.			
Recommended Literature	Main literature: 1. Law of the Republic of Uzbekistan “On electric energy”. Received June 24, 2009. 2. “On introducing amendments and additions to the Resolution 'On the approval of the rules for the preparation of doctoral dissertations and dissertation abstracts’ Decision of the Presidium of the Higher Attestation Commission under the Cabinet of Ministers of the Republic of Uzbekistan, registered on June 23, 2017, registration number 2665-1. 3. State standard ISO 50001-2012. Energy management systems. National norm. Requirements and ISO 50001: 2011. Guidance on the application of energy management systems - Requirements with an Operation Guide (IDT). 4. O.O. Hoshimov. A.T. Imomnazarov. Elektr mexanik tizimlarda energiya tejamkorligi. Toshkent-2015. “Fan va texnologiya” nashriyoti. 5. Xoshimov O. Sanoat korxonalarining elektr jihozlari montaji, Toshkent,-2007. 6. Majidov. Noana’naviy va qayta tiklanuvchi energiya manbalari. Toshkent-2014. 7. M.A. Graña-López, A. García-Diez, A. Filgueira-Vizoso, J. Chouza-Gestoso and A. Masdías-Bonome. Study of the Sustainability of Electrical Power Systems: Analysis of the Causes that Generate Reactive Power. Sustainability 2019, 11, 7202; doi:10.3390/su11247202. 8. Raxmonov I.U. “Elektr ta’minoti asoslari”. Darslik. Toshkent: 2019, 226 b. Additional literature: 1. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b. 2. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati’yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017–592 b. 3. Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 “On the Development Strategy of New Uzbekistan for 2022-2026”. 4. Decree of the President of the Republic of Uzbekistan No. PF-220 dated 09.09.2022 “On additional measures for the introduction of energy-saving technologies and the development of small-capacity renewable energy sources”. 5. General Aspects of Energy Management And Energy Audit. Guide Book For National Certification Examination For Energy Auditors and Managers. 6. Xoshimov F.A., Taslimov A.D. Energiya tejamkorligi asoslari. O‘quv qo‘llanma. – T.: “Voriz”, 2014 – 192 bet. 7. Аллаев К.Р., Хошимов Ф.А. Энергосбережение в			

	промышленных предприятиях, Монография. – Т.:Fan. 2012. 8. Aripov N. M. Elektr stansiyalarning elektr jihozlari, Toshkent,-2005 Internet resources: www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan. www.ziynet.uz – national educational materials search site. www.gov.uz – Government portal of the Republic of Uzbekistan. www.google.com – international educational materials search site. www.energystrategy.ru – “Energy Policy and Strategy” information portal www.twirpx.com – international educational materials search site.
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Name of subject	Scientific and pedagogical work (ECTS 12)											
Semester(s) in which the discipline is taught	1 st / 2 nd / 3 rd semesters											
Responsible teacher	Abdullaev Elnur Akhmatovich, Doctor of Philosophy (PhD) in Technical Sciences, Associate Professor Anarboev Mukhiddin Almanovich, Doctor of Philosophy (PhD) in Technical Sciences, Associate Professor Nazarov Furkat Daminovich, Doctor of Philosophy (PhD) in Technical Sciences, senior teacher. Yuldashe Urishbay, Doctor of Physics and Mathematics, professor Parsoxonov Abdulkobi Gafurovich, Candidate of Physical and Mathematical Sciences, Associate Professor.											
Education language	Uzbek											
Connection to the curriculum	Compulsory											
Training hours	Total hours-360 <table><tr><td>Semester</td><td>1</td><td>2</td><td>3</td></tr><tr><td>Total workload</td><td>120</td><td>60</td><td>180</td></tr></table>				Semester	1	2	3	Total workload	120	60	180
Semester	1	2	3									
Total workload	120	60	180									
ECTS	12											
Discipline objectives / Learning Outcomes	The purpose of the discipline is to acquire practical skills in teaching; the formation of professional competence, manifested in the readiness to develop models of Electric power industry classes, analyze them taking into account psychological, pedagogical and scientific-methodological requirements. Learning outcomes - the ability to apply methods of scientific knowledge in independent research activities, generate and implement innovative ideas; - own the methodology of scientific knowledge, be able to analyze and evaluate the content and level of philosophical and methodological problems when solving problems of research and innovation activities; - have the skills to use modern information technologies to solve research and innovation problems; - the ability to carry out pedagogical activities in educational institutions, to master and implement effective educational and information and communication technologies, pedagogical innovations; - master the techniques and methods of personal and professional development of a teacher-researcher, building a professional career and pedagogical ideals, norms and principles of pedagogical and scientific ethics, individual abilities and inclinations, etc.											
Lessons’ contents	Content 1. Current problems of Higher education, innovative and scientific-pedagogical activities 2.Methodology of scientific and pedagogical research 3.Information and communication technologies in scientific, pedagogical and innovative activities											

	4. Innovations in the History of Education as a Driving Factor of Development 5. Pedagogy and psychology of higher education 6. Management in Education 7. Teacher's personal effectiveness 8. Innovative approaches and technologies in education 9. Socialization and education in the context of global challenges and risks 10. Pedagogical skills and their formation			
The exam format	Preparation of the report and its protection			
Teaching/learning and examination requirements	No more than 3 days are allotted for drawing up the final report, during which masters put their individual plan in order, prepare written reports, and prepare presentations. Each masters submits the following materials: - Report text; - Individual plan and characteristics from the supervisor; - Presentations of master's students-interns in electronic form. The credit for research activities (practice) is accepted by the commission in accordance with the approved order, in the presence of all masters and their supervisors. During the certification, the competencies of master's students-interns, which they mastered in the process of carrying out research activities (practice), are assessed.			
CRITERIA for evaluating the tasks performed by students during their Master's degree scientific practice and research work and master's thesis preparation practice	T/r	Name of events and tasks	Allocated points	Report form
	1.	Current problems of Higher education, innovative and scientific-pedagogical activities	0-10	A report is prepared and a presentation is made
	2.	Methodology of scientific and pedagogical research	0-10	A report is prepared and a presentation is made
	3.	Information and communication technologies in scientific, pedagogical and innovative activities	0-10	A report is prepared and a presentation is made
	4	Innovations in the History of Education as a Driving Factor of Development	0-10	A report is prepared and a presentation is made
	5	Pedagogy and psychology of higher education	0-10	A report is prepared and a presentation is made

	6	Management in Education	0-10	A report is prepared and a presentation is made
	7	Teacher's personal effectiveness	0-10	A report is prepared and a presentation is made
	8	Innovative approaches and technologies in education	0-10	A report is prepared and a presentation is made
	9	Socialization and education in the context of global challenges and risks	0-10	A report is prepared and a presentation is made
	10	Pedagogical skills and their formation	0-10	A report is prepared and a presentation is made
Recommended Literature	1. Магистрлик диссертацияларини тайёрлаш бўйича методик тавсиянома: магистратура бўлимнинг барча мутахассисликлари учун мўлжалланган. – Т: ТДПУ, 2010. – 60 б. 2. Шермухамедова Н.А. Илмий тадқиқот методологияси. – Т.: “Fan va texnologiya”, 2014. – 512 б. 3. Алемасов В., Мамадалиев Ш. Илмий тадқиқот: методология, методика ва ижодиёт. – Т.: Ўзбекистон Республикаси ИИВ Академияси, 2015. – 102 б. 4. Ranjit Kumar. Research methodology a step-by-step guide for beginners. – Sage, New Delhi, 2011. – 415 p. 5. Саифназаров И., Никитченко Г.В., Б.У.Қосимов. Илмий ижод методологияси. – Т.: Янги аср авлоди, 2004. – 190 б. 6. Тўракулов Х.А., Тўракулов О.Х., Тўракулов И.Х., Тўракулов У.Х. Илмий тадқиқот асослари: 1000 саволга 1000 жавоб. – Т.: Fan va texnologiya, 2019. – 632 б.			

Discipline designation	Research practice (gaining practical experience) (ECTS 30)
Subject/module code	IA3410
Science taught semester (s).	4 th semester
Teacher in charge	Abdullaev Elnur Akhmatovich, Doctor of Philosophy (PhD) in Technical Sciences, Associate Professor. Anarboev Mukhiddin Almanovich, Doctor of Philosophy (PhD) in Technical Sciences, Associate Professor. Nazarov Furkat Daminovich, Doctor of Philosophy (PhD) in Technical Sciences, senior teacher. Yuldashe Urishbay, Doctor of Physics and Mathematics, professor. Parsoxonov Abdulkobi Gafurovich, Candidate of Physical and Mathematical Sciences, Associate Professor.
Teaching language	Uzbek
Connection to the curriculum	Compulsory
Academic activities	Total hours: 300 hours
ECTS	10
Discipline objectives / Learning Outcomes	The purpose of the discipline is to prepare a master's student for independent research work, the main result of which is the writing and successful defense of a master's thesis. Learning outcomes - the ability to apply methods of scientific knowledge in independent research activities, generate and implement innovative ideas; - own the methodology of scientific knowledge, be able to analyze and evaluate the content and level of philosophical and methodological problems when solving problems of research and innovation activities; - designing and conducting comprehensive, systematic scientific research based on knowledge and skills in the field of energy, including innovative studies; - have the skills to use modern information technologies to solve research and innovation problems; - conducting scientific research activities in the field of energy using modern research methods and information and communication technologies; - adapt the results of modern energy and technical research to solve problems in the electric power system.
Lessons' contents	1. Data collection at the place of scientific practice (internship) for the research topic 2. Approval of a plan for research work, determination of specific volumes and directions of scientific; 3. Get to know the scientific internship program and calendar plan 4. Preparation of an analytical review of the literature on the research topic 5. Development of experimental methodology 6. Carrying out theoretical and experimental work on the research topic 7. Material testing

	8.Presentation of practical research results at conferences 9.Development and justification of author's proposals, principles, approaches, interpretations 10.Experimental testing			
The exam format	Preparation of the report and its protection			
Teaching/learning and examination requirements	No more than 3 days are allotted for drawing up the final report, during which masters put their individual plan in order, prepare written reports, and prepare presentations. Each masters submits the following materials: - Report text; - Individual plan and characteristics from the supervisor; - Presentations of master's students-interns in electronic form. The credit for research activities (practice) is accepted by the commission in accordance with the approved order, in the presence of all masters and their supervisors. During the certification, the competencies of master's students-interns, which they mastered in the process of carrying out research activities (practice), are assessed.			
CRITERIA for evaluating the tasks performed by students during their Master's degree scientific practice and research work and master's thesis preparation practice	T/r	Name of events and tasks	Allocated points	Report form
	1.	Collecting data from the organization of scientific practice (internship) on the research topic	0-10	A report is prepared and a presentation is made
	2.	Approval of a plan for research work, determination of specific volumes and directions of scientific research (drawing up and approval of an individual work plan for a master's student);	0-10	A report is prepared and a presentation is made
	3.	Get to know the scientific internship program and calendar plan	0-10	A report is prepared and a presentation is made
	4	Preparation of an analytical review of the literature on the research topic	0-10	A report is prepared and a presentation is made
	5	Development of experimental methodology	0-10	A report is prepared and a presentation is made

	6	Carrying out theoretical and experimental work on the research topic	0-10	A report is prepared and a presentation is made
	7	Material testing	0-10	A report is prepared and a presentation is made
	8	Presentation of theoretical research results at conferences	0-10	A report is prepared and a presentation is made
	9	Development and justification of author's proposals, principles, approaches, interpretations	0-10	A report is prepared and a presentation is made
	10	Experimental testing	0-10	A report is prepared and a presentation is made
	Note: 1. Assignments are prepared in handwritten form and are approved by the student with a signature on each page. 2. The assignment is prepared based on a prescribed sample and approved by the relevant authorities. 3. Completed assignments will not be evaluated if they do not meet the assessment criteria.			
Recommended Literature	Main literature: 1. Law of the Republic of Uzbekistan "On electric energy". Received June 24, 2009. 2. "On introducing amendments and additions to the Resolution 'On the approval of the rules for the preparation of doctoral dissertations and dissertation abstracts'" Decision of the Presidium of the Higher Attestation Commission under the Cabinet of Ministers of the Republic of Uzbekistan, registered on June 23, 2017, registration number 2665-1. 3. State standard ISO 50001-2012. Energy management systems. National norm. Requirements and ISO 50001: 2011. Guidance on the application of energy management systems - Requirements with an Operation Guide (IDT). 4. O.O. Hoshimov. A.T. Imomnazarov. Elektr mexanik tizimlarda energiya tejamkorligi. Toshkent-2015. "Fan va texnologiya" nashriyoti. 5. Xoshimov O. Sanoat korxonalarining elektr jihozlari montaji, Toshkent,-2007. 6. Majidov. Noana'naviy va qayta tiklanuvchi energiya manbalari. Toshkent-2014. 7. M.A. Graña-López, A. García-Diez, A. Filgueira-Vizoso, J. Chouza-Gestoso and A. Masdías-Bonome. Study of the Sustainability of Electrical Power Systems: Analysis of the Causes that Generate Reactive Power. Sustainability 2019, 11, 7202; doi:10.3390/su11247202. 8. Raxmonov I.U. "Elektr ta'minoti asoslari". Darslik.			

Toshkent: 2019, 226 b.

Additional literature:

1. Mirziyoyev Sh.M. Yangi O‘zbekistonda erkin va farovon yashaylik. –T.: “TASVIR nashriyot uyi”, – 2021.– 50 b.

2. Mirziyoyev Sh.M. Milliy taraqqiyot yo‘limizni qati’yat bilan davom ettirib yangi bosqichga ko‘taramiz .–T.:“O‘zbekiston”, 2017–592 b.

3. Decree of the President of the Republic of Uzbekistan dated January 28, 2022 No. PF-60 “On the Development Strategy of New Uzbekistan for 2022-2026”.

4. Decree of the President of the Republic of Uzbekistan No. PF-220 dated 09.09.2022 “On additional measures for the introduction of energy-saving technologies and the development of small-capacity renewable energy sources”.

5. General Aspects of Energy Management And Energy Audit. Guide Book For National Certification Examination For Energy Auditors and Managers.

6. Xoshimov F.A., Taslimov A.D. Energiya tejamkorligi asoslari. O‘quv qo‘llanma. – T.: “Voriz”, 2014 – 192 bet.

7. Аллаев К.Р., Хошимов Ф.А. Энергосбережение в промышленных предприятиях, Монография. – Т.:Fan. 2012.

8. Aripov N. M. Elektr stansiyalarning elektr jihozlari, Toshkent,-2005

Internet resources:

www.lex.uz – National database of information on legal documents of the Republic of Uzbekistan.

www.ziyonet.uz – national educational materials search site.

www.gov.uz – Government portal of the Republic of Uzbekistan.

www.google.com – international educational materials search site.

www.energystrategy.ru – “Energy Policy and Strategy” information portal

www.twirpx.com – international educational materials search site.